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SESOURCESABSTRACTS



VOLUME 8, NUMBER 11 JUNE 1, 1975 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED

WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 8, NUMBER 11 JUNE 1, 1975

W75-05351 - W75-05850

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Research and Technology U.S. Department of the Interior Washington, D. C. 20240

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08 ENGINEERING WORKS

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09 MANPOWER, GRANTS, AND FACILITIES

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

THERMODYNAMIC STUDIES OF THE EF-FECTS OF SOLVENTS ON MOLECULAR COM-PLEX FORMATION EQUILIBRIA; ORIENTA-TION OF WATER AROUND NONPOLAR SOLUTES IN AQUEOUS SOLUTIONS, Oklahoma Univ., Norman. Graduate Coll.

Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-240 157, \$5.75 in paper copy, \$2.25 in microfiche. Ph. D. Dissertation, 1973. 117 p, 15 fig, 9 tab, 154 ref, 2 append. OWRT A-046-OKLA(1), 14-31-0001-3836.

Descriptors: *Thermodynamics, Solutes, Non-polarity, *Solvents, Reactions, *Molecular struc-ture, *Analog models, *Aqueous solutions, Free

Identifiers: Prigogine cell model theory, *Nonpolar analog models.

The effect of solvents on electron-donor-acceptor complex formation reactions has been studied thermodynamically. The nonpolar analog model (NPA) is examined theoretically and methods are developed for using it to predict thermodynamic properties of the transfer of donor, acceptor, complex makes make the transfer of donor, acceptor, complex makes and the control of the plex molecules from the gas phase into dilute solu-tions in nonpolar solvents. Thermodynamic results calculated by using the NPA model, in conjunction with solubility parameter theory and the Prigogine refined average-potential cell model theory, are compared with experimental results for polar components involved in several molecular complex formation equilibria. For individual solutes, in-cluding complexes, calculated and experimental free energies of transfer into hexadecane, diphenylmethane, heptane, cyclohexane, carbon-tetrachloride, and benzene generally agree to within 0.1 to 0.7 Kcal/mole. Application of the nonpolar analog model has been made for the pre-diction of solvent effects on molecular complex formation constants. W75-05447

2. WATER CYCLE

2A. General

THE ANALYSIS OF MONTHLY HYDROLOGIC

TIME SERIES,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.

MODELING INFLOWS INTO STRATIFIED LAKES WITH VERTICAL SCALE DISTOR-TION,

oma State Univ., Stillwater. School of Mechanical and Aerospace Engineering. For primary bibliographic entry see Field 2H. W75-05448

INVESTIGATION OF ARTIFICIAL LAKE DESTRATIFICATION -- A HYDRAULIC MODEL STUDY, Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering. For primary bibliographic entry see Field 2H. W75-05449

INVESTIGATION AND VERIFICATION OF A MODEL FOR THE DISPERSION COEFFICIENT TENSOR IN FLOW THROUGH ANISOTROPIC, HOMOGENEOUS, POROUS MEDIA WITH AP-

PLICATION TO FLOW FROM A RECHARGE WELL THROUGH A CONFINED AQUIFER, Wisconsin Univ., Madison. Dept. of Civil and En-vironmental Engineering. For primary bibliographic entry see Field 2F. W75-05458

AN EVALUATION OF THE THEORY OF GROUND-WATER AND RIVER-WATER IN-TERCHANGE, WINNEMUCCA REACH OF THE HUMBOLDT RIVER, NEVADA, Nevada Univ., Reno, Desert Research Inst. R. L. Cooley, and J. A. Westphal.

R. L. Cooley, and J. A. Westphal. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 172, \$4.75 in paper copy, \$2.25 in microfiche. Technical Report Series H-W, Hydrology and Water Resources Publication No. 19, April 1974. 74 p, 45 fig. 9 tab, 43 ref. OWRT B-065-NEV(1). 14-31-0001-3911.

Descriptors: *Model studies, Tritium, *Nevada, Evaluation, *Surface-groundwater relationships, Simulation analysis, *Water transfer, Water level fluctuations, Flow, Equations.
Identifiers: *Humboldt River(Nev), Boussinesq

equation, *Groundwater-river water interchange.

The objective was to determine whether or not the available data and basic theory are adequate for description of the interrelationships between ground water and surface water in a selected real system. The study was divided into three stages:
(1) review of the literature to determine the processes involved; (2) comparison of models which could simulate the water transfer process; and (3) application of a selected model to a real system. The results of the first two stages indicate that good accuracy could be achieved through use of the generalized Boussinesq equation in con-junction with a flow equation which applies for flow under the channel and which incorporates a term accounting for water transfer. The theoretical effects of unsaturated flow were negligible. To te the interrelationships between the Humboldt River and ground-water flow in contiguous sediments, the fluctuations of river stage from its fall and early winter 1962 level was routed empirically along the study reach using data from February 1962 through October 1962. The conclu-sion of this phase of the study is that the model reproduced most of the essential characteristics of the water-level fluctuations in wells in the study area. Constant permeability and constant evapotranspiration of the flood plain were adequate for the simulation, although allowing them to vary would have improved the results. Use of environmental tritium aided in establishment of the transfer process but could not be used quantitatively. (Fallon-Nevada) W75-05529

PROBABILISTIC MODEL OF HYDROLOGIC EVENTS, Arizona Univ., Tucson. Dept. of Watershed M. M. Fogel, J. L. Thames, and L. Duckstein Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 290,

3.25 in paper copy; \$2.25 in microfiche. Paper presented at Annual Meeting, American Society of Agricultural Engineers, Stillwater, Oklahoma, June 23-26, 1974. 13 p. 5 fig, 17 ref. OWRT B-032-ARIZ(8), 14-31-0001-3858.

Descriptors: "Watershed management, "Decision making, Optimization, Mathematical models, Stochastic processes, Simulation analysis, Systems analysis, "Model studies, Probability, Methodology, "Frequency analysis, "Distribution patterns, "Arizona, Peak discharges, Storms, "Rainfall-runoff relationships. Identifiers: *Probability models.

A methodology is presented for analyzing the frequency of rare hydrologic events. Two cases il-lustrate the procedure in which a previously developed event-based probability model is used. In the first instance, a frequency distribution was derived for the seldom-occurring tropical storms that pass through Arizona. Occurring on the average less than once every two years, these storms have produced record rainfall amounts. A technique for defining such storms from readily available National Weather Service climatological data was used to obtain a parameter value for the Poisson distribution describing the number of events per time interval. The maximal distribution of storm rainfall amount, from which the return periods are readily calculated, was obtained from the Poisson distribution and a gamma distribution fitted to the data of storm rainfall depths from 10 National Weather Service Stations. The selected stations were sufficiently far apart from each other that independence was assumed. For the second example, a distribution for peak discharges was derived with the assumption that storm depths and storm durations for the air mass (non-frontal) type of thunderstorm were unrelated random variables. The distribution was obtained by using the Soil Conservation Service method for estimating runoff from rainfall in a probabilistic formulation.

THE MICROCLIMATES OF THE ARCTIC TUN-

DRA, Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 2C. W75-05830

2B. Precipitation

PROPOSED RAINOUT HAZARD MODEL FOR SYSTEMS ANALYSIS STUDIES,

California Univ., Livermore. Lawrence Livermore Lab. For primary bibliographic entry see Field 5B. W75-05388

OPTIMUM DESIGN OF MOUNTAINOUS RA-INGAGE NETWORKS USING BAYESIAN DECI-

SION THEORY, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources

D. R. Davis, C. C. Kisiel, and L. Duckstein. In: Distribution of Precipitation In Mountainous Areas, Volume II; Proceedings of the Geilo Sym-Areas, Volume II; Proceedings of the Cenio Symposium, Geilo, Norway, July 31-August 5, 1972. World Meteorological Organization Publication No 326 (2 Vol), Geneva, Switzerland, p 416-420, 1973. 10 ref. OWRT C-3259 (No 3708) (4).

Descriptors: *Computer models, *Algorithms, Network design, Precipitation(Atmospheric), Watershed management, Thunderstorms, Moun-tains, Rainfall, Rain gages, Management. Identifiers: Bayesian decision theory.

The problem of spacing raingages along the slope of a mountain for managerial uses of the data was examined. As altitude increases, precipitation amount and the costs associated with raingages increase; on the other hand, the catchment area may decrease. These factors along with a loss function supplied by the managerial problem were incor-porated into a Bayesian Decision Theory framework in order to study the following problems: 1) the effect of uncertainty in the parameters of the rainfall model, due to limited data, on the raingage network design; and 2) the value of adding or removing one gage from a set. This conceptual framework was described. (Sims-

Group 2B—Precipitation

A FORTRAN IV COMPUTER PROGRAM TO TABULATE AND GRAPH MICRO-CLIMATIC

TABULATE

DATA,

Illinois Univ., Urbana. Dept. of Forestry.

For primary bibliographic entry see Field 7C.

W75-05671

A CLIMATIC MODEL OF URBAN ENERGY BUDGETS, California Univ., Los Angeles. Dept. of Geog-

raphy.

For primary bibliographic entry see Field 4C. W75-05683

TABLES AND CONVERSIONS FOR MICROCLIMATOLOGY, Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station. For primary bibliographic entry see Field 7C. W75-05717

TECHNIQUES FOR DETERMINING AMOUNTS AND DISTRIBUTION OF PRECIPITATION IN MOUNTAIN VALLEYS OF IDAHO, Idaho Univ., Moscow. Water Resources Research

E. W. Trihey.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 479, \$3.75 in paper copy, \$2.25 in microfiche. Termination Report, Open File Series, No. 203, June 1974. 39 p, 16 fig, 4 tab, 13 ref, 2 append. OWRR A-034-IDA(2). 14-01-001-3512.

Descriptors: Instrumentation, *Precipitation gages, *Idaho, Mountains, Valleys, River basins, *Distribution patterns, Measurement, Precipitation(Atmospheric).

Identifiers: Semi-arid mountain valleys, *Raft River Basin(Ida), *Precipitation distribution.

The Raft River Basin in southcentral Idaho was studied to develop techniques for determining precipitation distribution in semi-arid mountain valleys. Due to the frequency of gage malfunctions early in the study, a credible data base could not early in the study, a creation data base could not be obtained, and many of the analytical methods, envisioned as providing for a better utilization of precipitation data, were not tested. However, several techniques are presented which possess considerable utility to those interested in establishconsiderable during to mose interested in estations-ing reconnaissance type precipitation networks. The low-profile, ground-level gages developed are considered reliable and capable of measuring an-mula true-ground precipitation. W75-05783

THE MICROCLIMATES OF THE ARCTIC TUN-

Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 2C. W75-05830

COMBINED USE OF SATELLITE, RADAR, AND AEROSYNOPTIC INFORMATION FOR FORECASTING HEAVY PRECIPITATION, TAKING THE SNOWFALL OF OCTOBER 14-16, 1971, IN THE CENTRAL REGION OF THE EUROPEAN USSR AS AN EXAMPLE, N. I. Glushkova, G. G. Gromova, and V. F.

Soviet Hydrology, Selected Papers No 4, p 317-322, 1973, 3 fig, 1 tab, 4 ref. Translated from Transactions of the Hydrometeorological Scientific Center of the USSR (Trudy GMTs), No 116, p

Descriptors: *Probable maximum precipitation, *Forecasting, Snowfall, Radar, Satelites(Artificial), Precipitation gages, *Synoptic analysis, Clouds, Remote sensing, Aerial photography.
Identifiers: Vertical motions, *European USSR.

A study of satellite photographs, radar echo distribution, and synoptic weather was made of the heavy precipitation on October 14-16, 1971. The following preliminary conclusions were made:
(1)The occurrence of particularly dangerous precipitation is associated with upper frontal zones and the thermodynamic instability of the air mass in the frontal system. (2)If thick and intense (according to radar data) cumulus clouds, large horizontal temperature gradients (3-4C/150 km at the 850-mb level), and ascending vertical motions are observed in a deformed cloud system 200-400 km wide (according to satellite photographs), a further intensification of the process must be ex-pected. The maximum intensity of the process is observed near the top of the warm sector of a cyclone, where instability and humidity are maximal and the condensation level is low. (3)The appearance of descending motions must indicate that the process is weakening. (4)The maximum probable precipitation can be computed. (5)Radar data on clouds and phenomena should be entered on satellite photographs to determine the intensity of the process. (Jones-ISWS) W75-05841

RADIOMETRIC MEASUREMENTS STRATOSPHERIC WATER VAPOR IN THE SOUTHERN HEMISPHERE, Commonwealth Scientific and Industrial Research

Organization, Aspendale (Australia). Div. of Atmospheric Physics

Mospheric Physics. P. Hyson, and C. M. R. Platt. Journal of Geophysical Research, Vol 79, No 33, p 5001-5005, November 20, 1974. 8 fig, 11 ref.

Descriptors: "Water vapor, "Balloons, Instrumentation, Humidity, "Australia, Measurement, Precipitation(Atmospheric), Infrared radiation. Identifiers: "Radiometry, "Southern hemisphere(Aust), Stratosphere, Humidity mixing ratio, Golay cell.

An infrared radiometer was developed for measurement of water vapor content in the stratosphere. The instrument observes atmospheric emission in the strong water vapor rotational lines beyond 40-micrometers wavelength and at two zenith angles of 45 and 70 degrees. The method automatically compensates for instrumental gain change. A Golay cell was used as detector, and the instrument was flown on balloons to a maximum altitude of 27 km. Results obtained over Australia altitude of 27 km. Results obtained over Australia indicated a dry lower stratosphere with water vapor values in the 1-3 ppm range and a mean value of 2.1 ppm at 20 km, but on one occasion a wet layer (Approximately 6 ppm) was observed near 20-km altitude. (Jones-ISWS) W75-05844

RANDOM AND SYSTEMATIC ERRORS IN PRECIPITATION AT AN EXPOSED SITE, Waikato Valley Authority, Hamilton (New Zea-

K. R. Dreaver, and P. Hutchinson.
Journal of Hydrology (New Zealand), Vol 13, No 1, p 54-63, 1974. 3 fig, 4 tab, 13 ref, append.

Descriptors: *Precipitation(Atmospheric), *Rain gages, Winds, Fog, Statistical methods, Measurement, Meteorological data. Identifiers: *Systematic errors, *Random errors, Standard deviation, Catch deficiency, *New Zea-

The result of an experiment to determine the random and systematic errors in precipitation mea-surement at an exposed site in coastal Otago was recorded. Random errors of up to + or -10 percent can occur with standard gages, but these are reduced to + or -4 percent if ground-level gages are used. The most important factors affecting the systematic errors are wind speed and the height of the gage rim above ground. An exposed rainfall station should consist of a ground-level gage, a standard gage, a gage at a suitable height above ground, fitted with an Alter shield and a cup-counter anemometer. (Jones-ISWS)

2C. Snow, Ice, and Frost

TIC FIORD ENVIRONMENTS, PROGRESS RE-PORT MAY 1972-MARCH 1974, Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 5B. W75-05403 TRACE METAL ASSOCIATIONS IN SUB-ARC-

THERMAL CONDUCTIVITY OF A FROZEN HUBBARD LOAMY SANDY, Minnesota Univ., St. Paul. Dept. of Agricultural For primary bibliographic entry see Field 2G. W75-05442

RECURRENT GEOTHERMALLY INDUCED DEBRIS AVALANCHES ON BOULDER GLACI-ER, MOUNT BAKER, WASHINGTON, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2J.

IN GLACIER BORE HOLES, Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 7B. W75-05674 THE MEASUREMENT OF VERTICAL STRAIN

FROUDE CRITERION FOR ICE-BLOCK STA-

BILITY,
Cold Regions Research and Engineering Lab.,
Hanover, N.H.
G. D. Ashton.

Clasicles Vol 13, No 68, p 307-313, Journal of Glaciology, Vol 13, No 68, p 307-313,

1974. 4 fig, 8 ref.

Descriptors: *Ice, *Ice cover, *Stability, *Mathematical studies, Floating, Rivers, Streams, Froude number, Dimensional analysis, Ice jams, Analytical techniques. Identifiers: *Ice-block stability.

The conditions under which a floating fragment of ice is either entrained under the up-stream edge of a down-stream ice cover or accumulated upstream were examined by means of dimensional analysis and a simplified analysis of the stream of stream were examined by means of the moments analysis and a simplified analysis of the moments acting on an idealized ice fragment. The significant parameter descriptive of the critical conditions were found to be a Froude number based on block were found to be a Froude number based on block thickness. The influence of the ratio of thickness to flow depth was shown to be due to the effect of the block constricting the flow cross-section, thus amplifying the velocity in accordance with simple continuity. Under-turning instability occurs at a lower critical velocity than required for vertical submergence. Comparison of experimental data with the theoretical results showed good agreement and demonstrated the vital dependence on fragment thickness as well as providing a criterion readily applicable to special flow conditions where a Froude number based on flow depth is illogical. (Humphreys-ISWS)

GLACIAL HISTORY OF KOLAHOI GLACIER,

KASHMIR, INDIA, Aligarh Muslim Univ., (India). Dept. of Geology. N. Ahmad, and N. H. Hashimi. Journal of Glaciology, Vol 13, No 68, p 279-283, 1974. 3 fig, 6 ref.

Descriptors: "Glaciers, "Glacial drift, "Glaciology, Glaciation, Ablation, Movement, Geomorphology, Pleistocene epoch, History. Identifiers: "India(Kashmir), "Kolahoi Glaci-

Evaporation and Transpiration—Group 2D

Kolahoi Glacier is one of the longest glaciers in Kashmir and in the past it extended for at least 35 Adamm: and in the past it extended for at least 35 km. In the Pleistocene there were three advances of Kolahoi Glacier and the last one of them was a major advance when the glacier extended as far as Pahalgam. (Humphreys-ISWS) W75-05678

SUSPENDED-SEDIMENT TRANSPORT RELA-TIONSHIPS FOR FOUR ALASKAN GLACIER

STREAMS, Alaska Univ., College. Dept. of Geohydrology. For primary bibliographic entry see Field 2J. W75-05762

A TIME-SPACE TECHNIQUE TO ANALYZE SNOWPACKS IN AND ADJACENT OPENINGS IN THE FOREST, Arizona Univ., Tucson, Dept. of Watershed

For primary bibliographic entry see Field 4A. W75-05764

THE MICROCLIMATES OF THE ARCTIC TUN-

DRA,
Alaska Univ., College. Geophysical Inst.
G. Weller, and B. Holmgren.
Journal of Applied Meteorology, Vol 13, No 8, p
854-862, December 1974. 7 fig. 5 tab, 16 ref. NSF

*Microclimatology, Descriptors: *Alaska. *Arctic, *Tundra, Radiation, Precipita-tion(Atmospheric), Instrumentation, Snow cover, Albedo, Solar radiation, Heat flow, Clouds, Turbulence, Eddies, Heat balance, Moisture, Melting, Evaporation, Thermal properties, Air temperature, Profiles, Winds.

ture, Profiles, Winds. Identifiers: Inversions, Atmospheric stability, In-

The microclimates of the arctic tundar at Barrow. Alaska, were described for the near-surface ter-restrial layers in which most biological activities take place. Temperature profiles were constructed from detailed measurements in the air, vegetation. and soil, from 16 m above to 6 m below the tundra surface. Wind and radiation measurements supple-ment these data. Considering the tundra as a twodimensional heat exchange surface, daily com-ponents of the heat balance were computed and summarized for a number of periods throughout the year, which are characterized by changes of the physical nature of the tundra surface such as the physical nature of the tundra surface such as appearance and disappearance of snow, meltwater and precipitation, and growth and decay of vegetation. Through changes in surface terrain parameters such as albedo and roughness length, and availability of water for phase changes, the thermal and moisture regimes of the near-surface layer change markedly during these periods as reflected by the heat balance. (Jones-ISWS) W75-05830

CHARACTERISTICS THE OF HYDROMETEOROLOGICAL REGIME
DRAINED MINERAL SOILS,
For primary bibliographic entry see Field 2G. For primar W75-05833

USE OF TIME-LAPSE PHOTOGRAPHY TO AS SESS POTENTIAL INTERCEPTION IN ARIZONA PONDEROSA PINE, Arizona Univ., Tucson. Dept. of Watershed ement.

L. C. Tennyson, P. F. Ffolliott, and D. B. Thorud. Water Resources Bulletin, Vol 10, No 6, p 1246-1254, December 1974. 3 fig, 16 ref.

Descriptors: *Ponderosa pine trees, *Time series analysis, *Snowfall, Canopy, *Interception, Snow, Cameras, *Photography, *Arizona, Water

Identifiers: Snow accumulation. *Time-laysse photography.

The behavior of intercepted snow on a stand of uneven-aged ponderosa pine in eastcentral Arizona was evaluated with the use of a super 8mm time lapse movie camera to determine the relative significance of snowfall interception in the water yield of this type forest. A snow load index (Ratio of forest canopy area covered with snow to total canopy area) was developed to estimate intercoption storage for two trees in the field of view for discrete time periods. The snow load index, photographs, and climatic data were combined to describe accumulation and to identify and rank according to relative magnitudes the basic processes of canopy snow removal. The rate of snow accu-mulation was nonlinear with initial storage being rapid, then slowing with time. Most of the inter cepted snow eventually reached stemflow and dripping of meltwater, and was therefore not considered a significant loss to the water budget on site. Some water was apparently disposed of by the evaporation of meltwater and sublimation of canopy snow, but these losses appeared to be comparatively minor. (Roberts-ISWS) W75-05834

EFFECT OF THE ICE CONTENT, TEMPERA-TURE, CEMENTATION, AND FREEZING DEPTH OF THE SOIL ON MELTWATER IN-FILTRATION IN A BASIN, For primary bibliographic entry see Field 2G. W75-05836

2D. Evaporation and Transpiration

TRANSPIRATION DRYING OF SANITARY

LANDFILLS, Auburn Univ., Ala. Dept. of Civil Engineering. For primary bibliographic entry see Field 5E. W75-05523

ENVIRONMENTAL CONTROLS ON GROUND-WATER CHEMISTRY IN NEW MEXICO. I. THE EFFECT OF PHREATOPHYTES, New Mexico Inst. of Mining and Technology,

Socorro. Dept. of Geoscience. R. L. Naff, A. A. Baker, and G. W. Gross Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 190, \$5.25 in paper copy, \$2.25 in microfiche. New Mexico Water Resources Research Institute, Las Couces, Report 052, February 1975, 10 p, 17 fig, 1 tab, 18 ref, 4 append. OWRT A-030-NMEX(1).

Descriptors: *Evapotranspiration, *Salinity, *Consumptive use, *Rio Grande River, Pizometers, Ground-water, Chemical analysis, Water quality, *New Mexico, Flood plains.

Identifiers: Time-variant behavior, Populus wesl-

The relationships between phreatophyte-induced evapotranspiration, water level fluctuations, and changes in groundwater quality were investigated with arrays of nested piexometers installed on the Rio Grande flood plain. Consumptive use was computed from continuous water level records. The best correlation was found between consumptions are add accreaged maximum deily temperative use and averaged maximum daily tempera-ture, while a lack of direct recharge from precipitation at the site was indicated. The absence of a dominant salinity stratification in either space or time was the salient feature of the specific ductance data. A strong seasonal cyclic variation ductance data. A strong seasonal cyclic variation was observed which showed a strong inverse correlation with water table fluctuations caused by evapotranspiration. This is in agreement with a salinity mechanism of temporary 'deposition' of salts in and above the capillary fringe during the growing season, ascribed to the transpiring phreatophytes, and 'dissolution' of these salts in the fall and early winter as the phreatic surface rises. It is postulated that evapotranspiration causes fluctuations of the vertical hydraulic gradient which are responsible for the mixing and a weak diurnal cycle of specific groundwater conductance. (Hain-New Mexico State) W75-05531

EVAPORATIVE WATER LOSS FROM LARGE LAND AREAS IN THE FINGER LAKES Cornell Univ., Ithaca, N.Y. Dept. of Structural Engineering. W. H. Brutsaert.

W. H. Brutsaert. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 170, \$3.25 in paper copy, \$2.25 in microfiche. Technical Report No 86, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York, September 1974. 5 p, 1 fig, 1 ref. OWRT A-036-NY(2).

Descriptors: *Evapotranspiration, Methodology, Meteorological data, Research, Projects, Regions, Monthly, *New York, Mass transfer, Evaporation pans.
Identifiers: *Finger Lakes(NY), Land areas,

Geostrophic drag, Rawinsonde data.

A method has been developed to calculate evapotranspiration on the basis of published Rawinsonde data. The theory is based on the application of the geostrophic drag concept to derive an analogous 'mass transfer' formula. The method was applied to the Finger Lakes Region; the results were found to be highly correlated with pan evaporation data at Ithaca, New York.

EFFECT OF POTASSIUM CHLORIDE AND PHENYLMERCURIC ACETATE ON THE REGULATION OF STOMATAL OPENING AND WATER ECONOMY IN TEPHROSIA PUR-PUREA PERS, Jodhpur Univ., (India). Dept. of Botany.

T. Mathur, and D. N. Sen.
Flora (Jena). Vol 162, No 3, p 180-190, 1973. Illus. Hota details. Cleaves, Phenylmercuric acetate, Potassium chloride, *Stomatal opening, *Tephrosia-purpurea, *Transpiration, Water conservation(Plants), Spray treatment.

Investigations were carried out after the spray treatment with KC1, phenyl mercuric acetate (PMA) and water on the plants of T. purpurea with regard to the stomatal regulation and consequent water loss and total water content in leaves. They were examined at different durations after the above treatments. The KC1-treated plants lost above treatments. The KCI-treated plants lost much water as their stomata remained widely open. Less was lost in PMA and water-treated ones. The percentage of total moisture remained more in PMA-treated plants, when compared with water and KCI-treated ones, as these transpired far more water than the former.—Copyright 1974, Biological Abstracts, Inc. W75-05538

DROUGHT ADAPTATION IN OPUNTIA BASILARIS: SIGNIFICANCE OF RECYCLING CARBON THROUGH CRASSULACEAN ACID

METABON LISM, California Univ., Riverside. Dept. of Biology. For primary bibliographic entry see Field 21. W75-05547

A MODEL STUDY OF TRANSPIRATION FROM

PLANT LEAVES, Colorado Univ., Boulder. Dept. of Chemical En-

gineering. F. Kreith, J. N. Cannon, and D. Naot.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 444, \$3.25 in paper copy, \$2.25 in microfiche. AIAA Paper No. 74-733/ASME Paper No. 74-HT-40.

Group 2D—Evaporation and Transpiration

Presented at Thermophysics and Heat Transfer Conference, Boston. July 1974. 18 p., 14 fig, 11 tab, 26 ref. OWRT B-099-COLO(1). NSF GK17184.

Descriptors: *Evapotranspiration, *Transpiration, Stomata, Mass transfer, Antitranspirants, Water consumption, Ecosystems, *Leaves, Heat transfer, *Model studies, Reynolds number. Identifiers: *Turbulent penetration theory

An analytical method is presented for determining the rate of evapotranspiration from broad leaves ants from physical data such as relative humidity, solar insolation, size, number, and density of stomates, size of leaves, and external wind conditions. The analytical results are verified by experimental data obtained in an ecological wind tun-nel with models of plant leaves shaped from flat, perforated plates. Some anamolies in the data at higher Reynolds number are explained by a novel turbulent penetration theory. W75-05779

THE ESTIMATION OF SOIL MOISTURE DEFICITS BY PENMAN'S AND THORNTHWAITE'S METHOD IN MID CAN-

TERBURY, Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.

P. D. Fitzgerald.

Journal of Hydrology (New Zealand), Vol 13, No 1, p 32-40, 1974. 3 tab, 14 ref.

Descriptors: *Soil moisture, *Moisture deficit, *Evapotranspiration, Rainfall, Irrigation, Water requirements, *Estimating, Measurement, requirements, *Estimating, Measurement, Methodology, Instrumentation, Computer pro-

grams, Evaporation.
Identifiers: *Penman method, *Thronthwaite method, *New Zealand, Fortran programs.

A comparison was made between soil moisture deficits measured gravimetrically and soil moisture deficits obtained by estimating daily losses by evapotranspiration combined with daily rainfall to determine estimated soil moisture deficits. The methods used to estimate evapotranspiration were Thornthwaite's method and a number of modifications of Penman's method. Comparisons were based on estimates of irrigation water requirements, and use of the methods for irrigation timing. A Fortran program as written for a digital computer to calculate 12 modifications of Penman's method. The Thornthwaite estimates were available from an earlier program. The cli-matic data were recorded at the Winchmore meteorological station. The results showed that the original Penman method, based on the calculation of open-water evaporation, was the best of the Penman modifications, and that the Thornthwaite method was slightly superior to this. (Roberts-ISWS) W75-05831

AMOUNT OF WATER LOST BY TRANSPIRA-TION BY PLANT COMMUNITIES OF THE EASTERN PAMIR. (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii

N. N. Izmailova Ekologiya. Vol 5 No 1, p 95-97. 1974.

Descriptors: *Transpiration, Plant physiology. Identifiers: Artemisia rhodantha, Eurotia cera-toides, Oxytropis immersa, Pamir, Sibbaldis tetrandra, Stipa glareosa, Stipa orientalis. Sibbaldia

The seasonal dynamics of the amount of water lost by transpiration by plant communities of Eastern Pamir (USSR) usually reflects the picture of the dynamics of accumulation of the overground dynamics of accumulation of the overground mass. The maximum water losses are observed in the flowering phase which occurs in the warmest part of the vegetation period. At this time, an in-tense increment of the annotinous parts of the plants is observed, and the transpiration rate increases. In the European winterfat (Eurotia ceratoides) and feather grass (Stipa glareosa, S. orientalis) communities, and also in the majority of cushion plant communities (Sibbal-dia tetrandra, Oxytropis immersa, etc.) this occurs in the 2nd half of July and in the wormwood (Artemisia rhodantha) communities in Aug. At the end of the vegetation season, the amount of water transpired e communities decreases considerably (to 20 30% of the total water loss), which is related with a decrease of the transpiration rate and with fall of the green parts of the plants.—Copyright 1974, Biological Abstracts, Inc.

2E. Streamflow and Runoff

THE ANALYSIS OF MONTHLY HYDROLOGIC TIME SERIES.

Illinois Univ., Urbana. Dept. of Civil Engineering. L. Torelli.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 179, \$5.25 in paper copy, \$2.25 in microfiche. Ph D. Thesis, 1973. 106 p, 18 fig, 7 tab, 8 ref. OWRT B-038-ILL(9).

Descriptors: *Time series analysis, *Streamflow, *Precipitation(Atmospheric), *Temperature, Descriptors: "Ime senes analysis, "streamnow, "Precipitation(Atmospheric), "Temperature, Statistical methods, Stochastic processes, Methodology, Model studies, Mathematical studies, Hydrologic data, Correlation analysis,

The following monthly hydrologic time series, were analyzed monthly average temperatures, monthly precipitations, and monthly streamflows. The processes are commonly used as a model because a vast body of theoretical knowledge concerning both the probability structure of such processes (e.g., spectral analysis, Wold theorem) and their statistics (e.g., correlogram, spectral esti-mates and relative distributions and properties) are available to the analyst. However, it is conceivable that a more general class of stochastic processes may be needed in order to provide a suitable model for monthly hydrologic time series. The methods are described. (Woodard-USGS)
W75-05436

EVALUATION OF FLOOD PEAK PREDICTION METHODS IN NORTHERN NEVADA IN RELA-TION TO DAM SAFETY.

Nevada Univ., Reno. Desert Research Inst. For primary bibliographic entry see Field 8B. W75-05468

SIMULATION OF STORM VELOCITY EF-FECTS ON FLOW FROM DISTRIBUTED CHANNEL NETWORKS, Nebraska Univ., Lincoln. Dept. of Computer

Water Resources Research, Vol 10, No 6, p 1149-1160, December 1974. 15 fig, 1 tab, 6 ref. OWRT B-016-NEB (3).

Descriptors: *Simulation analysis, *Storm runoff, *Channels, *Velocity, Simulated rainfall, Computer models, Channel morphology, Networks, Flow system, Flood routing.

Identifiers: *Flow simulation, Binary tree model.

Programs were designed to perform computer simulation experiments on the effects of storms traveling over drainage networks. The system of uravening over drainage networks. The system of programs makes it possible to simulate the response of any channel network to storms with boundaries that are numerically specified by line segments. The excess runoff response function of discrete approximations of spatially distributed networks may be simulated for storms with any velocity and initial position. Storms were modeled as polygons surrounding areas of uniform intensity ding areas of uniform intensi as polygons surrous

ty. An average flow velocity for each segment of to. An average now velocity for each segment of the network could be specified independently by an input vector of transit times associated with network nodes. The computer time taken for each simulation of storm travel depended on the number of calculations performed in determining number of calculations performed in determining which network segments were overlapped by the storm. Results included hydrographs simulated for both actual fixed storms and for moving test storms that travel with specified speeds and directions over a binary tree model of a natural watershed with an assumed constant average in-ternal flow rate. (Terstriep-ISWS) W75-05518

FORM AND FLUVIAL PROCESSES IN ALLUVI-AL STREAM CHANNELS. STUDIES IN FLUVI-AL GEOMORPHOLOGY NO. 2, Purdue Univ., Lafayette, Ind. Dept. of Purdue Univ., Lafayette,

Geosciences.
E. A. Keller, and W. N. Melhorn.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 189, \$5.75 in paper copy, \$2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 47, December 1974. 124 p, 55 fig, 2 tab, 67 ref. OWRT A-022-IND(5).

Descriptors: *Channel morphology, *Weanders, *Streambeds, *Alluvial channels, Geomorphology, Rivers, Shape, Drainage patterns, Channels, Shoals, Dunes, Sand bars. Identifiers: *Riffles, *Pools, Point bars, Bifurcation ratio, Drainage network.

Selected aspects of form and fluvial processes for alluvial channels are defined quantitatively and qualitatively. The fluvial system includes the drainage network, geology, and hydrology. In the evolution of the drainage basin network these become mutually adjusted. As the drainage network develops from the simple to the complex, the range of bifurcation ratios fluctuates until a nearly constant value is reached. In the formation process of pools and riffles in a stream, there appears to be a balance of the time rate of energy expenditure through the pool-riffle sequence, which allows channel length to increase until a minimum value of energy expenditure is reached. A five-stage model is proposed to explain the develop-ment of alluvial channels. The model is based upon channel morphology, channel morphometry, and qualitative conclusions from numerous field ob-servations. Bed forms are classified to arrange the forms in a way tenable with known ideas, concepts, and processes which define and control al-luvial stream channels. A tentative generic classifi-cation is suggested which permits hierarchical ranking of common bed forms in straight, sinuous, and meandering alluvial channels. indering alluvial channels

DRAINAGE B. ISIN RESPONSE: DOCUMENTED HISTORICAL CHANGE AND THEORETICAL CONSIDERATIONS. STUDIES IN FLUVIAL GEOMORPHOLOGY. NO. 3, Purdue Univ., Lafayette, Ind. Dept. of

D. E. Edgar, and W. N. Melhorn.

D. E. Edgar, and W. N. Melnorn.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 188,
\$7.25 in paper copy, \$2.25 in microfiche. Purdue
University Water Resources Research Center,
Technical Report No. 52, December 1974. 196 p,
33 fig, 19 tab, 92 ref. OWRT A-022-IND(6).

Descriptors: *Watersheds(Basins), *Geomorphology, Documentation, *Drainage, Density, Sediment yield, Classification, Stream, Channel morphology, *Indiana. Identifiers: *Stream order, *Drainage net, Bifur-*Drainage, cation ratio, River network, Indian Creek

Archival materials dating from 1838 were examined in an attempt to document the historical

development of small drainage basins representative of Central Indiana. Owing to limitations in the available data sources, the study was confined to a comparison of five drainage basins in the Indian Creek Watershed, located approximately 6 miles west of West Lafayette, as mapped from 1938 and 1968 aerial photography. By using the Strahler or-dering system in combination with other, more dering system in combination with other, more recently proposed classification schemes and quantitative parameters, morphometric adjustments in the study basin were determined. In general, fourth-order basins experienced small losses in the number of stream segments and decreased in textural complexity while maintaining approximately the same total length of changes within the heart. Eith order beginning and nels within the basin. Fifth-order basins un-derwent significant increases in the number of seg-ments and textural complexity, and a small average increase in total channel length. All basins showed only minor changes in length, bifurcation, and division ratios with most of the drainage ad-justments occurring in the 'lost' or nonintegrated portions of the networks. Observed drainage changes were interpreted as resulting from fluc-tuations of climatic input, threshhold conditions, areal distribution of soil type and human activity through land use changes. W75-05527

STREAM GAGING BY CONTINUOUS INJECTION OF TRACER ELEMENTS, Arizona Univ., Tuscon. Graduate Committe on

W. L. Werrell.

M Sc thesis 1967. 85 p, 11 fig, 1 tab, 11 ref.

Descriptors: *Surface water, *Gaging stations, *Fluorescent dye, *Tracers, Tracking techniques, Dye dispersion, Southwest U.S., Arid climate,

Identifiers: Brilliant Pontecyl Pink B, Continuous

The extremely short periods of flow, the scour-onrise and fill-on-recession characteristics of sandchannel streams, the difficulty of making current-meter measurements, and the inaccessibility of stations that have no flood-warning system present serious difficulties in collecting surface water data in the Southwest U.S. and other arid or water data in the Southwest U.S. and other and or semi-arid regions. Stream gauging by fluorescent-dye (Brilliant Pontacyl Pink-B) tracer element in-jection and monitoring promises to overcome many of these difficulties. Although this approach is not new in principle, recent development in fluorometry and the development of new and less expensive fluorescent dyes warrant reappraisal of the method. Properties of the dye were examined by laboratory tests, and four field tests were con-ducted. Three of the tests allowed direct comparison between discharge computed by the dye-dilution method and discharge measured by a current meter; the maximum variation between the results of these tests was 11 per cent. The dye-dilu-tion method may be used on streams in the Southwest U.S. for high-water measurements of flow above wading stage where no cableway is present or where no adjacent current-meter mea-surement section can be found. (Campbell-NWWA) W75-05619

COMBINING ESTIMATES OF LOW-FLOW CHARACTERISTICS OF STREAMS IN MAS-SACHUSETTS AND RHODE ISLAND. Geological Survey, Boston, Mass. G. D. Tasker.

Available from the Superintendent of Documents, GPO, Washington, DC 20402, \$3.15. Journal of Research of the US Geological Survey, Vol 3, No 1, p 107-112, January-February 1975. 3 fig, 1 tab, 5 ref.

Descriptors: *Base flow, *Low flow *Massachusetts, *Rhode Island, Regression analysis, Average flow, Low-flow frequency.

The number of base-flow measurements needed to meet specified accuracy goals for estimating low-flow characteristics at ungaged sites can be reduced by combining an estimate based on a regression of base-flow measurements on discharges from a nearby continuous long-term againg station with an estimate based on a regional relationship developed from regressing the low-flow characteristics on basin characteristics. The estimates should be combined by weighting each inversely with its variance from the true value. Empirically estimated values of variance of the estimated 7-day, 10-year low flow from its true value indicate that more than six or eight base-flow measurements add little to the confidence which such an estimate is made. (Knapp-USGS) W75-05629

ADJUSTMENT OF LOGARITHMIC FLOOD-FREQUENCY STATISTICS FOR GAGED CALIFORNIA STREAMS TO MINIMIZE THE TIME SAMPLING ERROR, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 4A. W75-05630

SUMMARY OF MULTISPECTRAL FLOOD IN-UNDATION MAPPING IN IOWA, Iowa State Geological Survey, Iowa City For primary bibliographic entry see Field 7C.

GEOLOGICAL SURVEY, TALLAHASSEE, FLA. For primary bibliographic entry see Field 4A. W75-05640

DERIVATION OF HOMOGENEOUS STREAM-FLOW RECORDS IN THE UPPER KENTUCKY ER BASIN, SOUTHEASTERN KENTUCKY, Geological Survey, Louisville, Ky. J. O. Shearman, and R. V. Swisshelm, Jr. Open-file report, December 1973. 34 p, 17 fig, 2 tab, 4 ref.

Descriptors: *Streamflow forecasting, *Simulation analysis, *Mathematical models, *Kentucky, Low flow, Reservoirs, Routing, Reservoir operation.
Identifiers: *Kentucky River.

To provide increased knowledge of Kentucky River low-flow characteristics, digital computer programs were developed to route streamflow through reservoir and stream reach components of a stream system. Using these programs as sub-models, with available observed data, a digital model of the Upper Kentucky River basin was developed. This model was used to simulate streamflow data for use in determining the low-flow characteristics at Lock 10 on the Kentucky flow characteristics at Lock 10 on the Remucky River near Winchester, Kentucky, for 31 years of regulated conditions. Model inputs consisted of (1) reservoir operation criteria for an existing reser-voir; and (2) observed streamflow data for 21 years of natural and 10 years of regulated condi-tions. These modeling techniques are also suitable for studying alternative streamflow regulation schemes and expanding networks of homogeneous streamflow data for regional analysis. (Knapp-USGS) W75-05644

A MANUAL FOR ESTIMATING THE MAG-NITUDE AND FREQUENCY OF FLOODS ON UNGAGED STREAMS IN INDIANA, Geological Survey, Indianapolis, Ind. For primary bibliographic entry see Field 4A. W75-05645

LAKES MARION-MOULTRIE STREAM SYSTEM INVESTIGATION: PART I--MODEL

SELECTION, CALIBRATION, AND ERROR ANALYSIS, Geological Survey, Columbia, S.C. H. H. Jeffcoat, M. E. Jennings, and J. B. Peterson. Available from NTIS Springfield Va 22151 as PB-239 724, \$3.75 in paper copy, \$2.25 in microfiche. Water-Resources Investigations 25-74, October 1974. 54 p, 4 fig, 6 tab, 3 ref.

Descriptors: *Mathematical models, *Reservoirs, *South Carolina, Flood routing, Streamflow forecasting, Water level fluctuations, Hydroelectric power, Water yield. Identifiers: *Lake Marion(S.C.), *Lake Moultrie(S.C.), *Santee River(S.C.).

A daily stream-reservoir model was applied to the Lakes Marion-Moultrie system located in the lower Santee River basin, South Carolina. Twelve hydrologic events, representing a range of stream-flow magnitudes, were used to calibrate the model. The model is useful as a real-time forecasting tool for predicting Lakes Marion-Moultrie inflows and stages. An error-prediction method, based on probability concepts, was used to construct volume and elevation (Stage) error-frequency rela tions for both reservoirs. The relations allow rapid assessment of prediction errors. The model may be used for further studies associated with hydrologic simulation of the Lakes Marion-Moultrie system, particularly for hydropower studies. (Knapp-USGS) W75-05646

FLOOD OF AUGUST 2, 1972, IN THE LITTEL MAQUOKETA RIVER BASIN, DUBUQUE COUNTY, IOWA, Geological Survey, Iowa City, Iowa.

A. J. Heinitz.

Open-file report, September 1973. 28 p, 4 fig, 1 tab, 4 ref, append.

Descriptors: *Historic floods, *Iowa, Peak discharge, Rainfall-runoff relationships, Walevels, Basic data collections, Hydrologic data. Identifiers: *Little Maquoketa River basin(Iowa).

Flood peaks with magnitudes from 2 to 3 times the 50-year flood occurred on streams in the Little Maquoketa River basin, Iowa, August 2, 1972. Up to nine inches of rain fell in the headwater of the Middle Fork tributary, with 6 to 7 inches over most of the Little Maquoketa River basin. The flood peak elevationnat the gaging station near Du-rango exceeded the 1925 flood of record by 1.7 feet. Flood damages were extensive to homes, crops, and roads, and bridges. Flood damages were estimated to be over one million dollars. No loss of life or personal injuries were sustained. Flood-peak discharges at 12 sites, basin rainfall, a description of the 1972 flood, brief accounts of other major floods in the basin, maximum flood peaks in northeastern Iowa, selected flood-frequency data, and annual floods of record at 5 sites are given. (Knapp-USGS) W75-05648

FLOOD-FLOW CHARACTERISTICS OF THE CHENANGO RIVER AT PROPOSED IN-TERSTATE HIGHWAY IN TOWNS OF FENTON AND CHENANGO, BROOME COUNTY, NEW YORK,

Geological Survey, Albany, N.Y. For primary bibliographic entry see Field 4A. W75-05655

TRANSVERSE MIXING OF HEATED EF-FLUENTS IN OPEN-CHANNEL FLOW, State Univ. of Iowa, Iowa City. Dept. of Mechanics and Hydraulics. For primary bibliographic entry see Field 5B.

Group 2E-Streamflow and Runoff

STOCHASTIC MODELING OF THE PASSAIC RIVER FLOW, Rutgers - the State Univ., New Brunswick, N.J.

Dept. of Chemical Engineering; and Rutgers - the State Univ., New Brunswick, N.J. Dept. of Biochemical Engineering.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 293, \$5.25 in paper copy, \$2.25 in microfiche. Master's Thesis, October 19,2. 92 p, 25 fig, 21 tab, 29 ref, 5 append. OWRT A-035-NJ (1). 14-31-0001-

Descriptors: Streamflow, *Streamflow forecasting, Statistical methods, Statistical models, "Stochastic processes, "Time series analysis, Mathematical models, Synthetic hydrology, "Regression analysis, Computer models, Markov processes, "Model studies, "New Jersey. processes, *Model studies, *New Jerse; Identifiers: Sequential generation, River(NJ), *Autoregressive models. *Passaic

Time-series models of the moving-average and au-toregressive type, proposed by Box and Jenkins, have been applied to daily flow rates of the Passaic River. This technique is effective, even at small discharges, corresponding to the upper reaches of that river. The method applied worked successfully when it included the subtraction of the first Fourier harmonic, natural logarithmic transformation and one-day differencing. Autoregressive models are of comparable adequacy to moving-average models, but are substantially more economical in computer time required. Both chisquare statistics and skewness tests were applied to residuals. Second-order differencing of adjusted data is not helpful. Second-order autoregressive models are superior to first-order cases. The latter have superior Q- or chi-square statistics. Model parameters exhibit a marked similarity for a five-year sequence of data from the Chatham gaging station. Data from the Millington station exhibit comparable similarity. The data train from the Bernardsville station departs from the above pattern. Flow here is the least in magnitude and does present the greatest modeling difficulty. In general, however, the overall concept is able to relatively low discharge station would be improved substantially by taking rainfallrunoff into account, since these small discharges are more sensitive and more quickly responsive to precipitation. (Ahlert-Rutgers) W75-05660

THE DISTRIBUTION OF THE BOTTOM FAUNA IN SEVERAL STREAMS OF THE MID-DLE BALKAN IN THE SUMMER PERIOD, Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.

A. Kownacki, and M. Kownacka. Acta Hydrobiol. Vol 15, No 3, p 295-310. 1973,

Descriptors: *Benthic fauna, Bulgaria, Larvae. Identifiers: Chironomidae, Epl Oligochaeta, Plecoptera, Trichoptera. Ephemeroptera,

In the streams of the Middle Balkan (Bulgaria) the main component of the bottom fauna were the larvae of insects represented mainly by Ephemeroptera, Plectoptera, Trichoptera and Chironomidae. In the springs Oligochaeta occurred in masses. In these streams 6 communities of fauna were found which differed in their qualitative composition and in the structure of domination. On this basis, 2 types of streams were determined. The stream Ribarica is a typical stream of 'middle mountains' which may be classified, according to Illies, Botoseneanu; while the short upper parts of streams on the slopes of the Botev are of montane type.—Copyright 1974, Biological Abstracts, Inc. W75-05666 REVERSE FLOW ROUTING BY THE IMPLICIT METHOD, State Univ. of Iowa, Iowa City. Dept. of

Mechanics and Hydraulics.

R. N. Eli, II, J. M. Wiggert, and D. N. Contractor.

Water Resources Research, Vol 10, No 3, p 597-600. June 1974. 6 fig. 4 ref.

Descriptors: *Flow profiles, *Open channel flow, *Hydrographs, *River forecasting, Equations, Flow, Routing, Upstream, Downstream, Streamflow, Continuity equation, Momentum equation, Discharge(Water), Rivers, Hydrograph analysis. Identifiers: *Implicit method, Reverse routing.

The concept of reverse flow routing in rivers was described. In this approach, upstream flow hydro-graphs were specified from a downstream flow requirement. An example of reverse flow routing by the implicit method of solution of the momentum and continuity equations was presented. plane context. Of the possible directions of comprotections of computation, solutions were obtained only when proceeding in the directions of increasing time or decreasing distance. (Adams-ISWS)
W75-05675

MAYFLY LARVAE IN CURRENT HABITATS OF BELA CREEK (THE NORTHWESTERN PART OF MORAVIA, CZECHOSLOVAKIA). lastivedny Ustav Sumperku, (Czechoslovakia).

Acta Hydrobiol, Vol 15, No 3, p 311-320, 1973

Descriptors: *Mayflies, Czechoslovakia, Biomass. Identifiers: Baetis Alpinus, Baetis Rhodani, Bela

Vertical and seasonal distribution of the specific composition number and biomass of mayfly larvae in Bela Creek was studies in the period between May, 1969 and March, 1970. The specific composition gives the degree of pollution in individual habitats. The greater pollution under Jesenik has a negatve influence upon the specific composition and individual abundance of mayfly larvae. The slight pollution from individual houses scattered along the banks increases the number of larvae. Seasonal distribution of these larvae produced by the fluctuating occurrence of the most frequent species (Baetis alpinus and B rhodani) shows 2 peaks: in Dec.-March and in July. —Copyright 1974, Biological Abstracts, Inc. W75-05687

FLOOD FREQUENCIES AND BRIDGE AND CULVERT SIZES FOR FORESTED MOUNTAINS OF NORTH CAROLINA, Forest Service (USDA), Franklin, N.C. Coweeta

Hydrologic Lab.

J. E. Douglass. General Technical Report SE-4, August 1974. 21 p, 6 fig, 5 tab, 11 ref.

Descriptors: *Design flood, *Flood discharge, *Peak discharge, Culverts, Storm runoff, *North Carolina, *Flood frequency, E Watersheds(Basins), Forests, *Estimating. Identifiers: *Blue Ridge Province(NC). Bridges,

Accurate estimates of flood discharges from forested lands are needed for design of bridges and culverts. Equations incorporating watershed area and maximum elevation were developed for discharges at recurrence intervals of 2.33, 5, 10, 20, 30, 40, 50 years from forested land in the Blue Ridge Province of North Carolina. These equarange rrovince of North Carolina. These equations accounted for 98 percent of the variation in discharge. Capacity tables for several types and sizes of culverts are presented to simplify problems in culvert design. (Forest Service) W75-05715 RIVER FLOW INCREASES IN CENTRAL NEW ENGLAND AFTER THE HURRICANE OF 1938, Forest Service (USDA), Parsons, W. Va. Timber and Watershed I ab I H Patric

Journal of Forestry, Vol 72, No 1, p 21-25, January, 1974. 5 fig. 2 tab, 20 ref.

Descriptors: Streamflow increases, Water yield, Deforestation, *New England, Evapotranspiration, Hydrologic data, Large watersheds, *River flow, *Connecticut River, *Hurricanes. Identifiers: *Merrimack River

The New England hurricane of 1938 uprooted or broke off vast numbers of trees in watersheds of the Connecticut and Merrimack Rivers. Annual flow in both rivers increased about 5 inches during the first year after the hurricane. Another 5 inches of increased flow ran off at diminishing rates during the next two or three years. At least half of these flow increases occurred in July, August, and September when streams normally are at the lowest levels of the year. There was no evidence of increased flow five years after the hurricane when forest regrowth was well underway. (Forest Service) W75-05720

A SYSTEMS APPROACH TO THE OPERATION OF FLOOD CONTROL RESERVOIRS, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 4A. W75-05784

TRANSIENT THREE DIMENSIONAL MODEL. ING OF TEMPERATURE DISTRIBUTIONS IN RIVERS WITH AND WITHOUT THERMAL DISCHARGES, Purdue Univ., Lafayette, Ind. School of Mechani-

cal Engineering.
For primary bibliographic entry see Field 5B.
W75-05786

TRANSPORT OF SUSPENDED SOLIDS ALONG THE VISTULA RIVER,

Panstwowy Instytut Hydrologiczno-Meteorolog-iczny, Warsaw (Poland). For primary bibliographic entry see Field 2J. W75-05829.

2F. Groundwater

INVESTIGATION AND VERIFICATION OF A MODEL FOR THE DISPERSION COEFFICIENT TENSOR IN FLOW THROUGH ANISOTROPIC, HENOUR IN FLOW I HROUGH ANISOTROPIC, HOMOGENEOUS, POROUS MEDIA WITH APPLICATION TO FLOW FROM A RECHARGE WELL THROUGH A CONFINED AQUIFER, Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering. O. N. Fattah.

Available from the National Technical Informa-Avanable from the National Technical Information Service, Springfield, Va 22161 as PB-240 004, \$10.00 in paper copy; \$2.25 in microfiche. PhD Thesis, 1974. 340 p, 54 fig, 10 tab, 60 ref, 6 append. OWRT A-043-WIS(2). 14-31-0001-3850.

Descriptors: Physical properties, *Isotropy, *Porosity, *Fluid movement, Wells, *Distribution patterns, *Diffusion, *Model studies, *Dispersion, Porous media, *Recharge wells, Aquifers, Hydraulic conductivity.

Relationships for the dependence of the dispersion coefficients on flow, flow direction, media, and fluid properties in anisotropic, homogeneous, porous media were determined from one-dimenporous mean were determined from one-dimen-sional flow experiments on an anisotropic media model, constructed with thin, alternating layers of sand, having different mean sizes. These tests showed that: (1) the hydraulic conductivity and the longitudinal disperion coefficient are second-rank tensors with equal, constant eccentricities, and with major and minor principal axes oriented parallel and perpendicular to the sand layers, respectively; (2) the lateral dispersion coefficient is a second-rank tensor whose principal axes are orthogonal to the longitudinal dispersion coefficient tensor and whose eccentricity increases with velocity; and (3) the off-principal dispersivities are al to each other but opposite in sign. These relations were applied to well recharge in a con-fined, homogeneous, anisotropic aquifer. A nu-merical solution for the flow field from a partiallypenetrating well was developed using a central-dif-ference, alternating-direction, implicit scheme. A similar scheme was used to solve the mass consersimilar scheme was used to solve the mass conservation equation for a tracer added to this flow. This solution, however, developed unstable oscillations. Variations in the parameters of the scheme did not eliminate the instability. An apparatus simulating this well recharge problem was constructed; some testing of the flow field has been completed. (Hoopes-Wisconsin) w75-05458

POROSITY AND HYDROLOGY OF JOINTED MIDDLE ORDOVICIAN LIMESTONES IN THE J. PERCY PRIEST DAM AREA OF CENTRAL

TENNESSEE, Vanderbilt Univ., Nashville, Tenn. Dept. of

Geology. R. G. Stearns.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-239 994, \$4.75 in paper copy, \$2.25 in microfiche. Tennes-see Water Resources Research Center, Report No 33, Oct 1974. 86 p., 36 fig, 7 tab, 8 ref, 3 append. OWRT A-024-TENN(1).

Descriptors: *Porosity, *Limestone, *Water table, Joints(Geologic), Groundwater movement, *Tennessee, *Measurement, Excavation, Water Infiltration, storage, in Beds(Stratigraphic). Identifiers: J. Percy Priest Dam(Tenn), Nash-ville(Tenn), Bedding planes, Geologic folds.

Porosity was measured by three independent means (1) examination of surface excavations, (2) means (1) examination of surface excavations, (2) core records, and (3) water table rise from calculated rainfall recharge. Openings are a boxwork of planar solution openings (joints and bedding). In the upper 10 feet (generally above the water table) voids (partly dirt-filled) make up 15% of the rock volume. Voids have no soil and diminish in volume to about 1.5% at 30 feet and about .002% at 100 feet. Workshop of the table of the table of the soil of the s feet. Water levels reflect the land surface like an feet. Water levels reflect the halfs saled average unconfined water table. A minimum average lateral flow velocity is calculated to be .06 foot per lateral flow velocity is cal minute; direction is down the topographic (peizometric) slope. Most water (.90 of .95 inches) (peizometric) stope, most water (59 of 39 interests) is depleted from storage each year when surface streams reach their average low flow. This study has verified the estimates of Moore, Burchett and Bingham (1969) and Burchett and Moore (1970) of water in storage, infiltration rates by month, and depletion proportions. They used surface water recession curves whereas this investigation used direct measurements of porosity.

GROUND WATER ACTIVITIES IN THE USGS, Geological Survey, Washington, D.C. Ground Water Branch. For primary bibliographic entry see Field 4B. W75-05503

GROUNDWATER MODELS FOR TEXAS, Texas Water Development Board, Austin.
L. B. Seward, T. R. Knowles, and W. B. Klemt.
Presented at Water for Texas Conference, Texas
A and M University, College Station September
19, 1974, 29 p, 16 fig, 6 ref.

Descriptors: *Computer models, *Simulation anal-ysis, Groundwater management, *Model studies, *Texas, Groundwater movement.

Identifiers: Groundwater models, *Edwards Aquifer(Tex), *Carrizo Aquifer(Tex).

Sound groundwater management decisions must be based on the geohydrology of the aquifer, water demands, and the aquifer response to many alternative plans of operation. The high-speed electronic digital computer is able to store voluminous complex hydrologic data and rapidly analyze many alternative management plans at a reasonable cost. The comparison by managers, hydrologists, and others of the aquifer's response in terms of water level change results in the selection of a manage ment plan which is consistent with overall objectives at minimum cost. The construction of two digital groundwater models, one on the Edwards Aquifer in central Texas (Balcones Fault Zone) and one on the Carrizo Aquifer of south Texas, is described. Several model applications such as (1) simulation of future water levels using projected smutation of nume water levels using projects recharge and pumpage rates, (2) determination of optimum pumpage in specific regions and those suited to artificial recharge, (3) prediction of fu-ture spring flow under projected conditions, and (4) studies of movement of water quality parameters are presented as illustrations of how such models can be used as tools in a water planning operation. (Bradbeer-NWWA) W75-05508

GEOLOGY AND GROUND WATER RESOURCES OF SUSSEX COUNTY AND THE WARREN COUNTY PORTION OF THE TOCKS

WARREN COUNTY PORTION OF THE TOCKS ISLAND IMPACT AREA, New Jersey Dept. of Environmental Protection, Trenton. Div. of Water Resources. For primary bibliographic entry see Field 4B. W75-05513

GEOHYDROLOGY PLEISTOCENE OF DEPOSITS AND SUSTAINED YIELD OF PRIN-CIPAL PLEISTOCENE AQUIFER, LAKE COUNTY, INDIANA, Illinois Univ., Urbana. Dept. of Geology. J. S. Rosenshein.

PhD Dissertation 1966. 89 p., 26 fig., 9 tab., 37 ref. Descriptors: *Analog models, *P *Groundwater, *Aquifers, Glacial *Plesitocene. aquifers, Hydrogeology, Aquifer testing, Drawdown, Reservoirs, Discharge(Water), *Indiana.

Reservours, Discharge (water), "Indana. Identifiers: Kankakee confining layer, Kankakee aquifer, Valparaiso confining layer, *Lake Michigan aquifer, Aquifer response, Hydrostratigraphy, Lake County(Ind).

The Pleistocene deposits underlying Lake County, Indiana, are composed of four lithologic units. These units are (in ascending order): the Kankakee confining layer (a silt-clay till); the Kankakee aquifer (chiefly a glaciofluvial sand); the Valaraiso confining layer (a silt-clay till); and the paraiso confining layer (a sut-cray till), and Lake Michigan aquifer (chiefly a glaciolaucustrine Lake Michigan adulter (chiefty a giaciolaucustrine sand). The hydrologic properties of these units are given. Electric analog computer analysis of the hydrologic properties of the Kankakee aquifer and its leaky confining layer indicates that under equilibrium conditions the theoretical specific capacity of the artesian part of the aquifer ranges from 9.5 to 43.5 gallons per minute per foot of drawdown and in the watertable part from 7.9 to drawdown and in the wateratoic part from 7.9 to 33.5 gallons per minute per foot of drawdown. Computer estimates using a hypothetical pumping pattern demonstrates that the aquifer can readily sustain a yield of at least 20 million gallons per day. These computations show that, with the pat-tern of pumpage used, the aquifer head loss due to well interference can account for as much as 83 percent of the drawdown recorded at a pumping node. Further computations with the computer show that the aquifer in the vicinity of Crown Point, Indiana, can sustain a yield of about 1.5 million gallons per day or about twice the current withdrawal. (Bradbeer-NWWA) W75-05514 THEIS EQUATION ANALYSIS OF RESIDUAL

DRAWDOWN DATA, Nevada Univ., Reno. Desert Research Inst. C. M. Case, W. W. Pidcoe, and P. R. Fenske. Water Resources Research, Vol 10, No 6, p 1253-1256, December 1974. 1 fig, 2 tab, 11 ref, 2 append. OWRT A-059-NEV (1).

Descriptors: *Groundwater, *Aquifer characteristics, *Theis equation, *Aquifer testing, *Mathematical studies, Permeability, Transmisivity, Unsteady flow, Water level fluctuations, *Drawdown, Equations, Artesian aquifers, Diffusivity, Water wells, Storage coefficient, Observation wells vation wells.

Identifiers: Residual drawdown, Recovery data, Reversion series. Power series.

Equations were developed that allowed the transmissivity and storage coefficient of an aquifer to be determined from recovery data taken from an observation well located at an arbitrary distance from the pumped well without the use of an-tecedent drawdown data. The fundamental result was in the form of a series based on the Theis recovery equation and, up to the number of terms given, was exact. The assumptions of radial flow in a confined aquifer that is homogeneous, isotrop-ic, and semi-infinite, which are implicit in the Theis development, were also made. Two numerical examples with actual field data were given. (Prickett-ISWS) W75_05519

AN EVALUATION OF THE THEORY OF GROUND-WATER AND RIVER-WATER INTERCHANGE, WINNEMUCCA REACH OF TERCHANGE, WINNEMUCCA REAC THE HUMBOLDT RIVER, NEVADA, Nevada Univ., Reno. Desert Research Inst For primary bibliographic entry see Field 2A. W75-05529

ANALYSIS OF GROUND-WATER REGIMES BY USE OF NATURAL URANIUM ISOTOPE VARIATIONS, Florida State Univ., Tallahassee. Dept. of Geolo-

K. Osmond, L. I. Briel, J. B. Cowart, and M. I. Kaufman.

Available from the National Technical Inform Avanable from the National rectinical information Service, Springfield, Va. 22161, as PB-240 267, \$5.75 in paper copy, \$2.25 in microfiche. Completion Report, (1974), 123 p, 17 tab, 39 fig. 95 ref. OWRT C-3264(No 3710)(1), 14-31-0001-3710.

Descriptors: *Radiochemical analysis, *Uranium Descriptors: "Actiochemical analysis," "Oranium radioisotopes, "Groundwater movement, Radioactivity, Water sources, Aquifers, Effluent streams, Karst, Surface-groundwater relationships, "Florida, "Texas, Mixing, "Tracers, "Indication. Identifiers: "Floridan aquifer(Fla), "Carrizo aquifer(Tex), Santa Fe River(Florida), Radioactivity (Control of the Control of the C

The concentrations in natural waters of U-238 and 10-234 vary greatly both in absolute terms and rela-tive to each other. This isotopic phenomenon, which is due to processes related to the radiogenic which is due to processes related to the radiogenic origin of U-234 by way of intermediate daughters from U-238, can be used to study ground-water regimes in two ways: (1) as isotopic fingerprints of water masses, so that mixing volumes of diverse sources can be computed, and (2) as indicators of water-aquifer interactions through time, whereby the isotopic parameters are changed. Examples of the first kind of study include mixing volumes and sources of major Florida springs, and ground-water contributions to a Florida karstic river. Ex-amples of the second kind of study include analyes of the second kind of study include analysis of circulation patterns of the Carrizo aquifer of Texas and of the Floridan aquifer of south Florida. The analytical techniques are designed for low concentration-large volume samples, and include the use of an artificial yield tracer, U-232, and simple procedures for co-precipitation, ion exchange, electrodeposition, and alpha energy pulse height

Group 2F-Groundwater

W75-05535

STUDY OF FLUID MOVEMENTS THROUGH CAUSEWAY, Geological Survey, Menlo Park, Calif. Water

Resources Div.

Resources Dr.

R. T. Cheng, and M-H. Hu.

Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 101, No HY1, Paper 11076, p 155-165, January 1975. 5 fig, 10 ref, append. OWRT C-4025(9006)(2).

Descriptors: *Brines. *Groundwater movement. *Mathematical models, Finite element analysis, Saline water-freshwater interfaces, Hydraulic models, Porous media, Seepage, Embankments, Great Salt Lake, *Utah. Identifiers: *Causeways

The movements of fluid through the fills of a causeway separating fluids of different densities were examined by a numerical model. In the mathematical formulation, a two-fluid system through an inhomogeneous and anisotropic porous medium is assumed. Governing equations are solved iteratively by the finite element method using quadratic isoparametric elements. The porous medium is considered to be isotropic and homogeneous so that the positions of numerically calculated phreatic surface and the interface can be compared with those of the Hele-Shaw experi-ment. Both the calculations and the Hele-Shaw model show the existence of a counter-flowing fluids system, and their results are in good agree ment. Ratios of the total discharges in each direction are also computed. The model should be useful in studying the effects of causeways like the one in Great Salt Lake, Utah. (Knapp-USGS) W75-05610

A NUMERICAL TECHNIQUE FOR AQUIFER EVALUATION.

Illinois Univ., Urbana. Dept. of Geology. G. F. Pinder. Ph D Dissertation 1968. 74 p, 19 fig, 52 ref.

Descriptors: *Numerical analysis, *Computer programs, Hydrology, *Aquifer characteristics, Electric analogs, Computer models, Water supply, Glacial aquifers, Mathematical models, *Canada, Evaluation, Model studies. Identifiers: *Musquodoboit Harbour(Nova

A digital model capable of describing the response of an aquifer system to a wide range of hydraulic stresses was developed and applied to the in-vestigation of a complex aquifer at Musquodoboit Harbour, Nova Scotia, Canada. The model was designed to handle (1) non-homogeneous anisotropic porous media, (2) irregular boundary conditions and (3) vertical leakage to the aquifer. The program, written for the IBM 360 digital computer, was verified for a confined, homogeneous, isotropic aquifer with simple boundary geometry by comparing the values calculated from the digital model against those obtained from the analytical solutions. An electric analog simulator was constructed to test the precision of the digital model. The digital and electric analogs were pumped for selected periods of time and a com-parison of results was made. The transmissibility nd recharge boundaries of the digital model were adjusted until pump test results from the field were reproducible. (Bradbeer-NWWA) W75-05612

CHEMICAL HYDROGEOLOGY OF THE CAR-BONATE PENINSULAS OF FLORIDA AND YU-CATAN, Nevada Univ., Reno. W. Back.

Ph D Dissertation 1969. 71 p, 17 fig, 6 tab, 23 ref.

Descriptors: *Ground-water, *Carbonates, *Aquifers, *Subtropic, Mineralization, Aquifer characteristics, Artesian aquifer, Areal hydrogeology, Sinks, Circulation, Aquicludes, hydrogeology, Sin *Florida, *Mexico. Identifiers: *Yucatan Peninsula(Mex), *Hawthorn

Aquifers of the peninsulas of Florida and northern Yucatan are Tertiary marine carbonate formations showing great lithologic and faunal similarities. In addition, the tropical to subtropical climates of the two areas are similar, with annual rainfall of about 1000 to 1500 mm. Despite similarities in these fundamental controls, contrasts in the hydrogeologic and geochemical systems are numerous and strikor example, Florida has many rivers, while Yucatan has none. Maximum fresh ground water thickness is 700 m in Florida and less than 70 m in Yucatan. In Florida the chemical character of water changes systematically downgradient owing to solution of minerals of the aquifer and increases in dissolved solids, sulfate, calcium, and Mg-Ca ratio; in Yucatan the dominant controls are solution of minerals and simple mixing of the fresh water with the shallow salt water table. These differences are partially caused by the lower altitude of the Yucatan plain. More importantly, these differences are due to the lack of an upper containing bed in the Yucatan that is hydrologically equivalent to the Hawthorn Formation of Florida. The Hawthorn cover prevents recharge and confines the artesian water exept where it is punctured by sinkholes, which even then may be filled with sediment that impedes circulation. In Yucatan the permeability is so large that most rainfall immediately infiltrates to the water table and moves laterally to the coast. With time and length travel path in the Florida system, the Ma ratio increases downgradient systematically and approaches unity. (Bradbeer-NWWA) W75-05614

BIOLOGICAL POLLUTION INDICATORS IN UNDERGROUND WATERS. (IN SLOVENIAN), Kemijski Institut Boris Kidric, Ljubljana (Yugoslavia). For primary bibliographic entry see Field 5A. W75-05616

DIGITAL SIMULATION OF A STREAM-AQUIFER SYSTEM, Illinois Univ., Urbana. Dept. of Geology.

C Lin PhD Dissertation 1970. 69 p, 17 fig, 1 tab, 53 ref.

models, Synthetic Descriptors: *Computer models, *Data processing, *Simulation hydrology, Aquifer characteristics, Drawdown, Groundwater, Aquifers, *Canada, *Surfacegroundwater relationships. ldentifiers: *Musquodoboit River(Nova Scotia), Alternating direct implication method.

Ground water flow through an unconfined aquifer is described by a nonlinear second order partial differential equation similar to Poisson's equation is taken to the second power, (2) the coefficient of storage is replaced by the specific yield or effec-tive porosity of the porous media, and (3) the satu-rated thickness of the aquifer is a time-dependent variable. Finite difference approximations based on an irregular mesh matrix have been developed for the anisotropic, nonhomogeneous aquifer under confined and unconfined conditions. Com-parisons of filed test data and digital results under confined and unconfined assumptions led to the following conclusions: (1) both assumptions match the initial curve, but in long duration pumpage the theoretical unconfined data are the best fit, (2) dewatering can also account for the reported effects of a time-dependent coefficient of storage, (3) the role of transmission of the unconfined cone of depression is faster only initially and becomes the ver as pumping duration increases, (4) the maximum aquifer drawdown is controlled mainly by distance to and the rate of recharge of the Musquodoboit River (test area), (5) digital simulation appears to be consistant with a steady state, equilibrium model. (Bradbeer-NWWA) W75-05620

EFFECT OF CO2 ON THE CHEMICAL EQUIL-LIBRIUM OF SOIL SOLUTION AND GROUND

WATER, Arizona Univ., Tuscon. Dept. of Hydrology. For primary bibliographic entry see Field 2G.

NORMAN CREEK, A SOURCE OF RECHARGE TO MARAMEC SPRING, PHELPS COUNTY, MISSOURI

Geological Survey, Rolla, Mo. E. E. Gann, and E. J. Harvey.

Available from the Superintendent of Documents, GPO Washington, DC 20402, \$3.15. Journal of Research of the US Geological Survey, Vol 3, No 1, p 99-102, January-February 1975. 4 fig, 1 tab, 5

Descriptors: *Springs, *Missouri, *Tracers, *Dye releases, *Groundwater movement, Karst hydrology, Hydroegology, Fluorescent dye. Identifiers: *Maramec Spring(Mo).

Rhodamine WT dye was used to trace the subsurface movement of water from Norman Creek, a losing Ozark stream, to Maramec Spring, a straight-line distance of 8.7 mi. Grab samples and activated charcoal packets were used to check possible emergent points of the dye. The leading edge of the dye reached Maramec Spring 68-75 days after the dye injection, and the peak concentration reached the spring 82.03 days. tration reached the spring 82-93 days after injection. Small quantities of dye were still being recovered at the spring 114 days after injection and 39-46 days after the dye first arrived at the spring. Computed average velocities, assuming straight-line travel, are 0.47-0.42 ft/min for the leading edge and 0.39-0.34 ft/min for the peak. This apparent rate of travel compares favorably with other recent subsurface tracing studies in southern Missouri which generally range from 0.4 to 25 ft.min. (Knapp-USGS) W75-05627

EVALUATION OF HYDRAULIC CHARAC-TERISTICS OF A DEEP ARTESIAN AQUIFER FROM NATURAL WATER-LEVEL FLUCTUA-TIONS, MIAMI, FLORIDA, Geological Survey, Tallahassee, Fla. F W Meyer

Geological Su F. W. Meyer.

Florida Bureau of Geology, Tallahassee, Report of Investigations No 75, 1974. 32 p, 9 fig, 2 tab, 23

Descriptors: *Aquifer characteristics, *Florida, *Waste disposal wells, Hydrogeology, Water level fluctuations, Artesian aquifers, Artesian wells, Hydraulic conductivity, Diffusivity, Transmissivity, Tides. Identifiers: *Miami(Fla).

Natural water-level fluctuations in a 2,947-foot deep disposal well near Miami, Florida were analyzed to obtain estimates of the hydraulic difanalyzed to obtain estimates of the hydraulic dir-fusivity, hydraulic conductivity, specific storage, transmissivity, and the storage coefficient of the Boulder Zone aquifer. The fluctuations are caused chiefly by oceanic and earth tides, and by changes in atmospheric pressure. The oceanic tidal fluctua-tions probably result from loading due to tides in Biscayne Bay. Locally the water in the Boulder Zone is chemically equivalent to sea water and has a temperature of 60.8 deg F. The pressure head of the saltwater in the Boulder Zone at the 2,947-foot depth probably fluctuates at or near sea level. The quality and temperature of the water, evaluated with geologic considerations, suggest that the Boulder Zone crops out in the Straits of Florida and that hydraulic connection exists between the Boulder Zone and the Straits of Florida. (Knapp-USGS) W75-05633

SEDIMENTARY FACIES OF THE AQUIA FOR-MATION IN THE SUBSURFACE OF MARYLAND COASTAL PLAIN. Maryland Geological Survey, Baltimore. Report of Investigations No 21, 1974. 47 p, 28 fig, 4 plate, 83 ref.

Descriptors: *Aquifers. *Maryland, *Stratigraphy, Aquifer characteristics, Rock properties, Coastal plans. Identifiers: Lithology.

The Aquia Formation is an important source of groundwater in several Southern Maryland (Calver, St. Mary's) and Eastern Shore (Kent, Queen Anne's, Talbot) Counties. Prior to con-Anne's, Tabob' Countes. Profit of Countes structing a digital simulation model for predicting hydrologic responses to future pumping arrays a stratigraphic study was undertaken to determine both the internal (Fabric) and external (Boundaries) characteristics of the formation. The marine Aquia Formation of Paleocene age out-crops in Maryland as an irregular band extending from the Potomac River bluffs in western Charles County to the upper reaches of the Sassafras River in southeastern Cecil County. The Formation thickens and becomes more coarsely-texgured thickens and becomes more coarsely-textures toward the northeast, traversing at least two first-order facies. The oblique relationship between the outcrop belt and several lithofacies trends sug-gests that post-Eccene tilting has imparted to the Formation a structural strike that is demonstrably different from its depositional strike. In the subsurface the Aquia Formation exhibits a tripartite facies pattern: (1) a thick, coarser-textured sandy facies extending southwesterly in outcrop from Kent county to about the Patuxent River valley where it swings south into the subsurface toward southern St. Mary's County; (2) a finely textured sand to silt-clay facies, occurring chiefly in Charles coutny and southern Prince George's County; and (3) a thinner, very muddy facies that appears to underlie much of the Eastern Shore seaward of the Choptank River; it does not out-crop. (Knapp-USGS) W75-05638

GEOLOGICAL SURVEY, TALLAHASSEE, FLA. For primary bibliographic entry see Field 4A. W75-05640

COUNTY, TEXAS.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W75-05641 GROUND-WATER RESOURCES OF GRIMES

ANALOG-MODEL STUDIES OF GROUND-WATER HYDROLOGY IN THE HOUSTON DIS-Geological Survey, Austin, Tex. For primary bibliographic entry see Field 4B. W75-05642

LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON REGION, TEXAS, Geological Survey, Houston, Tex. For primary bibliographic entry see Field 4B. W75-05643

HYDROGEOCHEMISTRY OF THE NORTHERN YUCATAN PENINSULA, MEXICO, WITH A SECTION ON MAYAN WATER PRACTICES, Geological Survey, Reston, Va. W. Back, and B. B. Hanshaw.

In: Field Seminar on Water and Carbonate Rocks of the Yucatan Peninsula, Mexico; published for Field Trip 2, 1974 Annual Meeting, Miami, of the Geological Society of America: New Orleans Geological Society, p 45-77, 1974, 10 fig. 4 tab. 12

Descriptors: *Hydrogeology, *Karst hydrology, *Geochemistry, *Mexico, *Limestones, Water chemistry, Water balance, Water levels, Water resources development.
Identifiers: *Yucatan(Mexico).

The flat, low-lying northern Yucatan Peninsula is composed of extensive outcrops of Teritiary limestone. Elevations range from sea-level to about 50 m. Areas of thin soil cover are interspersed with bare limestone outcrops. The area receives between 500 to 1500 mm of rainfall per year, but the high porosity and permeability cou-pled with thin soil cover cause the potentiometric surface to be only a few meters above sea level throughout most of the area. Chemical character of the groundwater is controlled regionally be solution of carbonate and sulfate minerals and by mixing with a body of saltwater that is believed to be a few tens of meters below land surface throughout the area studied. Contamination by sewage may also be locally important. Aspects of ancient Mayan water systems and the importance of water in the Mayan cluture, are also discussed. Present-day water systems and some problems of saltwater and sewage contamination are discribed. (Knapp-USGS)

MID-1971 GROUND-WATER CONDITIONS AT YANKEETOWN WELL FIELD, LEVY COUN-

ogical Survey, Tallahassee, Fla. G. L. Faulkner.

Open-file report 72001, January 1972. 23 p, 5 fig.

Descriptors: *Groundwater, *Florida, *Canals, Water levels, Water quality, Water table, Water pollution sources. Identifiers: *Yankeetown(Fla).

By mid-1971, no measureable change in water quality in the Yankeetown well field has resulted from construction of the Cross-Florida Barge Canal. Any decline in groundwater levels in the Yankeetown well field as a result of construction of the Cross-Florida Barge Canal is too small to be assigned to a particular hydrologic factor. (Knapp-USGS) W75-05649

APPLICATION STATISTICAL OF TECHNIQUES TO THE ESTIMATION OF GROUND-WATER WITHDRAWALS NORTHWESTERN KANSAS, Geological Survey, Lawrence, Kans. For primary bibliographic entry see Field 4B. W75-05651

CHEMICAL INTERACTION DURING DEEP WELL RECHARGE, BAY PARK, NEW YORK, Geological Survey, Mineola, N.Y. Water Resources Div. Por primary bibliographic entry see Field 5B. W75-05656

NUMERICAL ANALYSIS OF PUMPING FROM CONFINED-UNCONFINED AQUIFERS, Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.

2G. Water In Soils

CONTAMINATION LIMITS FOR REAL AND PERSONAL PROPERTY, PROGRESS REPORT, JULY-DECEMBER 1973, Los Alamos Scientific Lab., N. Mex. For primary bibliographic entry see Field 5A. W75-05379

FEASIBILITY AND ALTERNATE PROCEDURES FOR DECONTAMINATION
AND POST TREATMENT MANAGEMENT OF
PU-CONTAMINATED AREAS IN NEVADA,
California Univ., Los Angeles. Lab. of Nuclear
Medicine and Radiation Biology.
For primary bibliographic entry see Field 5G. W75-05384

THERMAL CONDUCTIVITY OF A FROZEN HUBBARD LOAMY SANDY. Minnesota Univ., St. Paul. Dept. of Agricultural

Engineering. J. E. Gilley, Jr.

Available from the National Technical Inform tion Service, Springfield, Va. 22161, as PB-240 025, \$4.75 in paper copy, \$2.25 in microfiche. M.S. Thesis, July 1974. 80 p, 6 fig, 5 tab, 45 ref, 6 append. OWRT B-057-MINN(3), 14-31-0001-3602.

Descriptors: *Heat transfer, *Soil moisture, *Thermal conductivity, Frost, Loam, Sands, Measurement, Soils, *Frozen soils.

The heat transfer characteristics of a naturally occurring field soil were examined. A transient-state, cylindrical thermal probe was built. Tests were conducted on a fine Ottawa sand under both dry and saturated conditions to compare the prob response the results reported previously. Thermal conductivities of a naturally occurring, forzen, Hubbard loamy sand were determined at five soil moisture contents at temperatures of -15.5 and 2.5C. Results show a range in measured conductivity values from a low of .437 watts /mC at a moisture content of .82% by weight to a high of 1.74 watts/mC at 16.6% moisture content. (Walton-

NITRATE MOVEMENT IN SOIL UNDER EARLY SPRING CONDITIONS, Wisconsin Univ., Madison, Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B. W75-05457

ADSORPTION OF PHOSPHORUS BY UNSATU-RATED SYNTHETIC SOIL, Purdue Univ., Lafayette, Ind. Dept. of Agricul-For primary bibliographic entry see Field 5B. W75-05463

CHEMICAL PROPERTIES AND PARTICLE-SIZE DISTRIBUTION OF 39 SURFACE-MINE SPOILS IN SOUTHERN WEST VIRGINIA, Forest Service (USDA), Princeton, W. Va. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 5A.

FACTORS AFFECTING THE ESTABLISHMENT OF DIRECT-SEEDED PINE ON SURFACE-MINE SPOILS. Forest Service (USDA), Princeton, W. Va. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4D. W75-05493

Group 2G-Water In Soils

AVOID PROBLEM SPOILS THROUGH OVER-BURDEN ANALYSIS, Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 5A.

INFLUENCE OF ENDRIN ON SOIL MICROBI-AL POPULATIONS AND THEIR ACTIVITY,
Forest Service (USDA), Portland, Oreg. Pacific
Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W75-05497

OVER TIME ON SEVERELY DISTURBED GRANITIC SOILS: A MODEL, Forest Service (USDA), Boise, Idaho. Intermoun-tain Forest and Range Experiment Station. For primary bibliographic entry see Field 4D. W75-05499

A PROCEDURE FOR PLACING LARGE UNDIS-TRUBED MONOLITHS IN LYSIMETERS,
Texas A and M Univ., College Station. Dept. of
Soil and Crop Sciences. K. W. Brown, C. J. Gerard, B. W. Hipp, and J. T.

Soil Science Society of America Proceedings, Vol 38, No 6, p 981-983, November-December 1974, 2 fig, 7 ref. OWRR B-148-TEX (2).

Descriptors: *Lysimeters, *Research equipment, Equipment, Installation, Instrumentation, Leachate, Moisture content, Soil water, Water balance, Drainage. Identifiers: Undisturbed soil.

Increasing need for studies of leaching water and possible pollutants through soil profiles led to the development of a method for placing large undisturbed soil monoliths in metal boxes for use as drainage lysimeters. Materials and equipment used in the technique are usually available or can be leased from local contractors. Monoliths as large at 1.5 m deep and with surface areas of a large as 1.5 m deep and with surface areas of 3 m have been taken. The technique could be used for even larger monoliths. Thus far, lysimeters have even arger monouns. Inus rar, lyameters nave been installed in clay, sandy clay, loam and sand soils. The upper lip of several of the lysimeters described was buried 25 cm below the surface to allow normal tillage, bed preparation, and furrow irrigation. (Dawes-ISWS) W75-05517

REMOVAL OF CATIONS FROM LEACHATE INTERACTION WITH SUBSURFACE SOILS.

Environmental Protection Agency, Boston, Mass. Solid Waste Management Branch. For primary bibliographic entry see Field 5G. W75-05589

11

MOISTURE AND DENSITY RELATIONS ON MOISTURE AND DENSITY RELATIONS ON GRADED STRIP—MINE SPOILS, Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4C. W75-0592

EFFECT OF CO2 ON THE CHEMICAL EQUIL-LIBRIUM OF SOIL SOLUTION AND GROUND

Arizona Univ., Tuscon. Dept. of Hydrology. K. L. Dyer.

PhD Dissertation 1967. 129 p, 4 fig, 18 tab, 112 ref.

Descriptors: *Soil chemistry, *Water chemistry, Drainage effects, *Soil water, Soil tests, Analytical techniques, Ion exchange, Absorption, *Groundwater, *Carbon dioxide. Identifiers: Panoche, Hesperia soils, Meta soils, Foster soils, White House soils, Mount Lemmon

The equilibrium equations relating dissolved CO2, HCO3(-), CO3(-), H(+), solid phase CaCO3, exchangeable H(+) and ionic strength were programmed for simultaneous solution on a 7072 IBM digital computer. This routine was combined with an existing program which had been successfully used to relate the equilibrium of soluble and exchangeable Ca(++), Mg(++), Na(+), dissolved Cl(-), SO(4(-), and NO3(-), and Solid phase CaSO4 2H2O. The final systems analysis model developed accounted for most of the dissolved substances normally present in significant quantities in ground waters and soil solutions. It is possible to calculate equilibrium concentrations resultble to calculate equilibrium concentrations resultble to calculate equilibrium concentrations resulting from an arbitrary change in a constituent. The model was used to predict the equilibrium concentrations of ionic species in soil solutions at different moisture and carbon dioxide levels. The soils tested were of a wide variety and the chemical predictions obtained were of the same level of accuracy as the experimental methods used to determine these chemical constituents. The model was used to estimate the concentrations of the chemical constituents which would have been in solution at the time they were sampled. A common origin for water above and below the water table was indicated. (Bradbeer-NWWA) W75-05623

SALTY BARK AS A SOIL AMENDMENT, Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station. Research Paper PNW-128, 1971. 16 p, 12 tab, 27 ref. PNE 1602.

Descriptors: *Bark, *Saline water, Technology, Inhibitors, *Douglas fir trees, Sea water, Leaching, *Soil amendments. Identifiers: Salty bark.

Bark from Douglas-fir logs floated in water contained 0.75 to 1.94 percent salt vCl). Leaching by natural and simulated rainfall ⊾ad by soaking readily removed this salt. Brush bean and tomate plants vere grown in the greenhouse on a sandy loam as an incorporation at the rate of 40 tons per acre. Mulches containing 0.75 and 1.41 percent salt had little effect on beams but bark ng 1.94 percent salt was slightly deprescontaining 1.94 percent sait was singiny depres-sive; all the incorporations were depressive. To-mate plant yields were reduced by all the bark treatments, most severely by the incorporations. Use of salty bark at usual rates on the soil can in-jure salt sensitive plants. Mulches would be less hazardous than incorporations. Chunk sizes would probably cause no toxic effects. Most soil microbes and their essential activities are not likely to be appreciably influenced by salt leached into the soil from salty bark. (Forest Service) W75-05718

FLOODPLAIN MEADOWS OF THE LOWER COURSE OF THE PRIPYAT' RIVER, (IN BYELORUSSIAN), Akademiya Navuk BSSR, Minsk. Inst. of Experi-mental Botany. N. I. Pyetruchuk. Vyestsi Akad Navuk BSSR Syer Biyal Navuk, 1, p 15.10, 1974.

15-19, 1974.

Descriptors: *Grasslands, USSR, Soil moisture, *Flood plains, Vegetation. Identifiers: Pripyat River.

The conditions of development of the meadow vegetation of the flood plain of the lower course of the Pripyat' River in the Belorussian SSR (USSR) the Pripyat' River in the Belorussian SSR (USSR) were analyzed on the basis of geobotanic investigations and many years' data of the hydrometeorological service. An edaphic-phytocoenotic classification of meadows is presented. For each isolated taxon, data on soil, nutrient elements, accumulation of humus, soil reaction, moisture content, characteristics of vegetation cover and yield for individual formations is presented.--Copyright 1974, Biological Abstracts, Inc. W75-05723

EXPERIMENTS OF INFILTRATION WITH AIR ECTS IN A VERTICAL RECTANGULAR EFFECTS IN A VERTICAL RECTANGULAR SLAB OF SOIL,
Colorado State Univ., Fort Collins. Dept. of Civil

Engineering.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 450, \$5.75 in paper copy, \$2.25 in microfiche. M.S. the-sis, December 1973. 121 p, 32 fig, 39 tab, 16 ref, 3 append. OWRT B-070-COLO(10).

Descriptors: *Infiltration, Flow, *Sands, Soils, Simulation analysis, *Subsurface flow, *Ponding, Air circulation.

Identifiers: *Subsurface hydrology, *Two-phase

flow, Air pressure.

An experimental investigation of a two-phase flow in an unconsolidated sand is described. A simula-tion of the natural infiltration process, more realistic than in usual columns, was tested using a larger soil surface and a rainmaker device which produced a known rainfall. Ponding and runoff were also allowed. The flume was airtight. Air and liquid pressure at various depths and the infiltra-tion rate were measured during the progression of the wetting front. Infiltration without ponding and with ponding were studied with two types of lower the wetting front. Infiltration without ponding and with ponding were studied with two types of lower boundary conditions, either impervious bottom or bottom open to the atmosphere. An air pressure build-up in the medium was observed in almost all cases. Its importance is related to the liquid saturation behind the wetting front. The air pressure variations with time are related to the variations of the infiliestics rate. In the product once the infil. the infiltration rate. In the ponding case, the infiltration rate was constant at the beginning, then decreased and after a slight secondary increase tended to a value less than the hydraulic conductivity at the natural imbibition saturation. (Morel-Seytoux-Colorado State) W75-05777

THE ESTIMATION OF SOIL MOISTURE DEFICITS BY PENMAN'S AND THORNTHWAITE'S METHOD IN MID CAN-

TERBURY,
Department of Agriculture, Ashburton (New Zealand), Winchmore Irrigation Research Station.
For primary bibliographic entry see Field 2D.
W75-05831

CHARACTERISTICS OF THE HYDROMETEOROLOGICAL REC HE WINTER REGIME OF DRAINED MINERAL SOILS.

DRAINED MINERAL SOILS,
M. A. Borisovskiy.
Soviet Hydrology, Selected Papers No. 3, p 207213, 1973. 2 fig, 5 tab, 4 ref. Translated from
Transactions of the Voyeykov Main Geophysical
Observatory (Trudy GGO), No. 306, p 61-73, 1973.

Descriptors: *Agroclimatology, *Drainage practices, *Hydrothermal studies, *Soil temperature, Winterkilling, Tile drainage, Seasonal, Snow cover, Soil moisture, Air temperature, Frozen soils, Wetting.
Identifiers: *Soil reclamation work, Frost meters, *USSR(Baltic States), Sod-calcareous loam.

Two periods with different relations between soil temperatures in drained and undrained areas were distinguished. In the warm period, the temperature of undrained soils was 1.5-2.5C higher than in of undrained soils was 1.5-2.5C higher than in drained soils. Conversely, in the cold period, drained soils averaged 1.5-2C colder than undrained soils. The temperature differences increased to 2.5-4.0C in the upper 0.5 m of the soil during very cold periods and remained high even at drain depth (0.6-0.8C). The depth of freezing of drained soils was greater by a factor of 1.3-1.5 than that of undrained soils, depending on moisture

conditions in the preceding autumn. Freezing depth increased with increasing drainage intensity, the greatest depth being recorded for cross drainage, which was 8% greater than for tile drainage, and 6% greater than for plastic drains. ons were obtained for converting the depth of soil freezing in a meteorological area to that in a drained winter wheat field. As a rule winter crops in Latvia were not damaged by low temperatures, but by the too high temperatures observed under the snow. Therefore, drainage of excessively wet soils was an essential part of crop cultivation prac-tices. (Schicht-ISWS) W75-05833

EFFECT OF THE ICE CONTENT, TEMPERATURE, CEMENTATION, AND FREEZING DEPTH OF THE SOIL ON MELTWATER INFILTRATION IN A BASIN, V. D. Komarov, and T. T. Makarova. Soviet Hydrology, Selected Papers No 3, p 243-249, 1973, 4 fig, 17 ref. Translated from Transactions of the Hydrometeorological Center of the USSR (Trudy Gidromettsentra SSSR), No 113, p 76-85. 1973. 76-85 1973

Descriptors: *Infiltration, *Melt water, *Snowmelt, *Frozen ground, Snow cover, Temperature, Spring, Winter, Permeability, Field capacity, Frost, *Frozen soils, Absorption, *Ice. Identifiers: *Cryopedology, Steepe Zone.

The main factors responsible for the permeability of the soil prior to snow melting are its icc content and depth of freezing. The effect of the temperature of the frozen soil on its permeability is not known but is considered significant. The spatial variations of the factors determining infiltration, particularly the ice content and depth of freezing of the soil, are vey large and are important factor in the infiltration of meltwater in a basin. Further study of the effect of various factors on meltwater infiltration in an elementary area and in a basin as a whole requires large-scale experimental and theoretical investigations. (Schicht-ISWS) W75-05836

A SAMPLER FOR TAKING SOIL SAMPLES FROM SPECIFIC SOIL ZONES, North Carolina State Univ., Raleigh, Dept. of Soil For primary bibliographic entry see Field 7B.

LIMITATIONS OF THE INSTANTANEOUS PROFILE METHOD FOR FIELD MEASURE-MENT OF UNSATURATED HYDRAULIC CON-

DUCTIVITY,
Wisconsin Univ., Madison. Dept. of Soil Science.
F. G. Baker, P. L. M. Veneman, and J. Bouma.
Soil Science Society of America Proceedings, Vol.
38, No 6, p. 885-888, November-December 1974. 4 fig. 13 ref

Descriptors: "Hydraulic conductivity,
"Unsaturated flow, "Soil moisture, "Soil tests,
"Soil profiles, Laboratory tests, Moisture content,
Nuclear moisture meters, Soil moisture meters,
Instrumentation, On-site laboratories, Tensiometers, Conductivity, Moisture.

Identifiers: Instantaneous profile method, *Soil-

water potential, Vertical flow.

Technical problems and soil profile characteristics may limit the applicability of the instantaneous profile method for field measurement of unsaturated hydraulic conductivities. A modified procedure for tensiometer installation and different methods for measuring moisture contents were discussed. Good agreement was found between moisture contents determined in situ with the neutron-probe and those indirectly derived from moisture retention curves obtained from measurements of large core samples in a closed as-sembly. Sloping soils with slowly permeable horizons or with lateral water movement cannot be characterized adequately with this method. The use of the crust test procedure was recommended. (Prickett-ISWS) W75-05843

ANALYSIS OF THE YIELD-DETERMINING PROCESS AND ITS APPLICATION TO YIELD PREDICTION AND CULTURE IMPROVEMENT
OF LOWLAND RICE: CXIV. ON THE INCREASE OF NITRATE NITROGEN UTILIZATION RATIO AT THE TILLERING STAGE OF
RICE PLANTS. (IN JAPANESE),
National Inst. of Agricultural Sciences, Konosu
(Inpan) Part of Plant Physiciacy and Genetics

(Japan). Dept. of Plant Physiology and Genetics. A. Matsuzaki, S. Matsushima, and T. Tomita. Proc Crop Sci Soc Jap. Vol 42, No 2, p 178-184. 1973. Illus. English summary.

Descriptors: *Rice, *Nitrates, Nitrogen, Cultivation, Till, Fertilizers, Forecasting, Analysis. Identifiers: Yield, *Utilization ratio.

The effective duration of NO3-N applied on the surface water of paddy fields was less than 7 days. NO3-N might be utilized at least for 2 wk after topdressing at the tillering stage. The utilization ratio of NO3-N in lowland soil was higher in the water-saturated paddy condition than in the flooded one, because of the high oxidation-reduction potentials of soil in the saturated condition. The utilization ratio of NO3-N was about 70% compared with that of NH4-N. In the upland soil, there was no difference in the utilization ratio regardless of water conditions and N sources, because of its high oxidation-reduction potentials. When temperature was low at the tillering period, the utilization ratio of NO3-N in water-saturated paddy field was inferior to that of flooded paddy field, where a growth promotion by high water temperature was concerned, because flooded water was liable to be concerned, because Hooded water was native to be warmed by sunlight and water temperature was higher than air temperature. NO3-N showed higher efficiency in split application at the rate of 1/2 dose/wk than that of the full dose (N 5 g/m) application at a time. The utilization ratio of NO3-N applied by the split method at the growth stage of 60-70 in the leaf number index can be raised to about 70% compared with that of NH4-N.--Copyright 1974, Biological Abstracts, Inc. W75-05849

2H. Lakes

CHLORIDES IN LAKE ERIE BASIN, State Univ. of New York, Buffalo. Dept. of Civil Engineering. For primary W75-05355 bibliographic entry see Field 5B.

PHYTOPLANKTON PRODUCTION IN CHAR LAKE, A NATURAL POLAR LAKE, AND IN MERETTA LAKE, A POLLUTED POLAR LAKE, CORNWALLIS ISLAND, NORTHWEST TERRITORIES, McGill Univ., Montreal (Quebec). Dept. of Biolo-

gy. For primary bibliographic entry see Field 5C.

PHYSIOLOGICAL STATE THE PHYSIOLOGICAL STATE WITH RESPECT TO PHOSPHORUS OF CAYUGA LAKE PHYTOPLANKTON, New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Ecology and Systematics

Section. For primary bibliographic entry see Field 5C. W75-05406

CALCULATED DISTRIBUTION OF THE CHEMICAL SPECIES OF COPPER, ZINC,

CADMIUM AND LEAD IN 16 LAKES OF

NORTHERN ITALY,
European Atomic Energy Community, Ispra
(Italy). Joint Nuclear Research Center. For primary bibliographic entry see Field 5B. W75-05413

THE RELATION BETWEEN PRIMARY PRODUCTIVITY, NUTRIENTS, AND THE TROUT ENVIRONMENT IN SOME NEW ZEALAND LAKES, Marine Part Wellington Co. Marine Dept., Wellington (New Zealand). Fish Research Div.

For primary bibliographic entry see Field 5C. W75-05419

CAREFUL RENEWAL OF A CAMPUS LOCH, Sheffield Univ. (England).
For primary bibliographic entry see Field 5G. W75-05426

JOINING FORCES TO SAVE DAMAGED LAKES IN SWEDEN AND TUNISIA, Lund Univ. (Sweden). For primary bibliographic entry see Field 5G. W75-05428

MODELING INFLOWS INTO STRATIFIED LAKES WITH VERTICAL SCALE DISTOR-TION.

Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering. G. E. Kouba.

G. E. KOUGA.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 015, \$4.25 in paper copy, \$2.25 in microfiche. Master of Science Thesis, July 1974. 60 p. 25 fig, 1 tab, 15 ref, 2 append. OWRT A-050-OKLA(2).

Descriptors: *Dispersion, Lakes, Mixing, *Stratification, *Model studies, *Inflow, Distribution pattern, Reynolds number, Density stratifica-

Identifiers: *Lake models, Vertical scale distortion, Richardson number.

The objectives were to evaluate the effect of vertical scale distortion and to develop criteria for modeling flows in stratified lakes. The inflow distribution in one lake model was compared with the distribution in another model which was identical in horizontal dimensions but different by a factor in notizonial unlessons out affected by a factor of two in the vertical dimensions. Tests were compared on the basis of different expressions for the Richardson and Reynolds numbers. Density profiles and dye fronts were examined to establish the degree of similarity between any two runs on the degree and shallow models. The degree of the deep and shallow models. The degree of similarity was plotted against Richardson number ratios and Reynolds number ratios for each pair of runs. The effect of vertical scale distortion is different for lateral dispersion than for vertical distortion. A different expression for the Richardson number must be used to model the dispersion patterns as seen from the top than the one used to model the dispersion as seen from the side. (McLaughlin-Oklahoma State) W75-05448

INVESTIGATION OF ARTIFICIAL LAKE DESTRATIFICATION - A HYDRAULIC

MODEL STUDY,
Oklahoma State Univ., Stillwater. School of
Mechanical and Aerospace Engineering. T. A. Gibson.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 187, \$5.25 in paper copy, \$2.25 in microfiche. Master of Science Thesis, July 1974, 90 p, 25 fig, 2 tab, 31 ref, 7 append. OWRR A-050-OKLA(1).

Descriptors: Lakes, Mixing, *Stratification, Model studies, *Destratification, *Artificial lakes, *Hydraulic models, Lake basins, Jets.

Group 2H-Lakes

Identifiers: Mechanical destratification, *Lake models, Vertical scale exaggeration, Richardson number, Density profiles.

The objective was to develop a useful technique for modeling artificial lake destratification. The modeling technique included the use of vertical scale exaggeration. A model basin which is similar to a real lake was constructed in the laboratory, and experiments were conducted to compare the model with the prototype lake. The destratification was accomplished by the jet of water from a shrouded propeller mixing the top water into the bottom water. Data from the real lake included density profiles as a function of time and the total time required for destratification. Pairs of non-dimensional parameters were used to describe the destratification process. The ability of the technique to model artificial lake destratification was tested. The comparison of the density profile from the prototype lake and the model basin showed similarity using one form of the Richardson number. This number, with the non-dimensional time scale, forms a pair of parameters for modeling the destratification process. (Moretti-Oklahoma State)

SELECTIVE WITHDRAWAL AT AN INTERMEDIATE DEPTH FROM A DENSITY
STRATIFIED IMPOUNDMENT,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W75-05456

THE RELATIONSHIP BETWEEN WATER-FOWL AND NITROGEN SPECIES IN THE WATERS OF THE BOSQUE DEL APACHE, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry. For primary bibliographic entry see Field 5B. W75-05469

THE LIFE CYCLE AND PRODUCTION OF THE LEACH EROPOBDELLA OCTOCULATA (L.) (HIRUDINEA: EROPOBDELLIDAE) IN LAKE DISTRICT STREAM, Freshwater Biological Association, Ambleside

J Anim Ecol Vol 42, No 2, p 435-448. 1973. Illus.

Descriptors: *Life cycles, Mortality, Lakes, Production. Identifiers: *Leeches, *United Kingdom(English lake district).

The life cycle of E. octoculata took 2 yr in the Wilfin Beck, a small, stony stream in the English Lake District. The leeches bred and died at the end of their 2nd year. Exponential rates of mortality and growth varied throughout the life cycle, but were constant in each year-class for the same period in the life cycle. In most months, there was a negative correlation between rates of mortality and growth. Production was highest in the 1st year of the life cycle and occured chiefly in the period of rapid growth (March-July). Although estimates of production and standing crop varied considerably between years and between year-classes, ratios of production (P) to mean standing crop (B) were very similar in each year (Mean annual value of P/B ratio = 1.5).—Copyright 1974, Biological Abstracts, Inc.

HYDROBIOLOGICAL AND ICHTHYOLOGICAL STUDIES ON THE COASTAL LAKES TASAUL AND GARGALIC IN VIEW OF THEIR USE FOR FISH MANAGEMENT, (IN RUMANIAN), For primary bibliographic entry see Field 8I. W75-05495

THE DIEL ACTIVITY PATTERN, DRIFTING AND FOOD OF THE LEECH ERPOBDELLA OCTOCULATA (I.) (HIRUDINEA: ERPOBDELLIDAE) IN A LAKE DISTRICT STREAM, Freshwater Biological Association, Ambleside

(England).

J Anim Ecol. Vol 42, No 2, p 449-459, 1973, Illus.

Descriptors: Inset populations, Larvae. Identifiers: Erpobdella octoculata, *Leeches, *United Kingdom(English lake district).

The locomotory activity of the leech E. octoculata increased at night, and the nocturnal periodicity was controlled solely by changes in light intensity. Larvae of Chironomidae were the principal food of the leeches and were taken chiefly at night. There was a strong positive correlation between mortality rate and the number of leeches with empty stomachs, and between the mean weight of food consumed/unit weight of leech and growth rate. A few leeches drifted downstream at night during periods of rapid growth, but drift losses were always less than 1% of the total losses from the population. Life tables were constructed to compare mortality in each year-class. The chief regulatory mechanism for the size of the population was mortality of the eggs which were eaten by mature leeches when the population density was high.—Copyright 1974, Biological Abstracts, Inc. W75-05498

OHIO BIOLOGICAL SURVEY BIOLOGICAL NOTES NO. 6. EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO, WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS, Ohio State Univ., Columbus. For primary bibliographic entry see Field 5C. W75-05505

EVAPORATIVE WATER LOSS FROM LARGE LAND AREAS IN THE FINGER LAKES.

Cornell Univ., Ithaca, N.Y. Dept. of Structural Engineering.
For primary bibliographic entry see Field 2D.
W75.0532

EFFECT OF FERTILIZERS AND DENSE STOCKING IN FATTENING PONDS ON THE HYDROCHEMICAL REGIME AND NATURAL FOOD BASE, (IN RUSSIAN), Akademiya Nauk Uzbekskoi SSR, Tashkent. In-

Akademiya Nauk Uzbekskoi SSR, Tashkent. Institut Zoologii i Parazitologii. V. S. Polishchuk, V. P. But, G. N. Maryutina, and

T. Yu. Malykhina. Uzb Biol Zh, Vol 17, No 6, p 43-45, 1973.

Descriptors: *Carp, Ammonium nitrate, Superphosphate, *Walleye, Fish farming, Phytoplankton, Zooplankton, Benthic fauna.

Data are presented on the effect of fertilizers (ammonium nitrate and superphosphate) and dense stocking of yearling and 2-yr-old common carp, silver carp, speckled carp, grass carp, snakehead and walleye with feeding, on the hydrochemical regime, phytoplankton, zooplankton and zoobenthos in fattening ponds at the Akkurgan fishery in the Tashkent region (USSR).—Copyright 1974, Biological Abstracts, Inc. W75-05601

SOME ECOLOGICAL EFFECTS OF ARTIFICIAL CIRCULATION ON A SMALL EUTROPHIC LAKE WITH PARTICULAR EMPHASIS ON PHYTOPLANKTON. 1. KEZAR LAKE EXPERIMENT, 1968, New Hampshire Univ., Durham. Dept. of Zoolo-

gy. For primary bibliographic entry see Field 5C. W75-05609 PHYTOPLANKTON AND PRIMARY PRODUCTION OF A HIGH LAKE IN THE PYRENEES: A FRACTORIAL ANALYSIS OF 'CORRESPONDENCES' APPLIED TO DATA FROM LAKE PORT-BIELH. (IN FRENCH), Toulouse-3 Univ. (France). Laboratoire de Biologie Quantitative.
L. Bonnet, and J. Capblancq.
Ann Limnol. Vol 9, No 3, p 183-192. 1973, Illus. (English summary).

Descriptors: *Phytoplankton, *Primary productivity, Lake sediments, Thermal stratification. Identifiers: Lake Port-Bielh, Pyrenees.

A factorial analysis of 'correspondences' shows that light and dissolved substances (CO3, PO4-P) are the prime factors responsible for the phytoplankton cycle and the pelagic primary production in Lake Port-Bielh (2285 m, France). The diffusion of nutrients originating from the sediments depends on the degree of thermal stratification in the lake.—Copyright 1974, Biological Abstracts, Inc.

CHEMICAL AND BIOLOGICAL CONDITIONS OF LAKE OKEECHOBEE, FLORIDA, 1969-72, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5C. W75-05634

ANNUAL DYNAMICS OF VERTICAL DISTRIBUTION OF THE NUMBER OF HETEROTROPHIC BACTERIA IN SOUTHERN BAIKAL, (IN RUSSIAN), For primary bibliographic entry see Field 5C. W75-05636

PHYTOBENTHOS AND PRIMARY PRODUC-TION OF A HIGH MOUNTAIN LAKE IN THE CENTRAL PYRENEES. (IN FRENCH), Toulouse-3 Univ. (France). Laboratorie

Toulouse-3 Univ. (France). Laboratorie d'Hydrobiologie.
J. Capblancq.
Ann Limnol. Vol 9 No 3, p 193-230, 1973. Illus. En-

Ann Limnol. Vol 9 No 3, p 193-230. 1973. Illus. English summary.

Descriptors: *Benthic flora, Algae, *Primary productivity, Biomass, Phyoplankton, Lakes, France. Identifiers: Nitella Flexilis, Pyrences.

The importance of the benthic algal community in the primary productivity of a (French) high mountain lake is evaluated. The lithophytic algae of the littoral zone (6-19 m), form a biomass about 140 times greater than the mean biomass of the phytoplankton during the summer. Nitella flexilis forms 80% of the benthic algal biomass; the variations in its chlorophyll content show an adaptation to the light climate which it partly determines. The colonization of artificial substrata was found to be not very adequate for evaluating the production of periphyton; it indicated a productivity 10 times less in the littoral zone than in the littoral profundal zone. Measurements, with 14C of the rate of assimilation of N. flexilis and epiphytic algae revealed that, as a consequence of the phenomena of compensation by the development of periphyton and the adjustment of chlorophyll content photosynthetic activity is not very dependent of light. The contribution of benthic algae to the primary production is estimated to be 30%. Their role in the cycling of chemical elements is considered.—Copyright 1974, Biological Abstracts, Inc.

THE ECOSYSTEM OF THE ARCTIC LAKE NORDLAGUNA, JAN MAYEN ISLAND: III. ECOLOGY OF ARCTIC CHAR, SALVELINUS ALPINUS (L.), Tromsoe Univ. (Norway). Inst. of Biology and Geology.

S. Skreslet. Astarte. Vol 6, No 2 p 43-54. 1973 Illus.

Descriptors: *Fish food organisium, Lakes. Identifiers: Char, Chricotopus Basalis, Jan-Mayen Island, Lake Nordlaguna(Norway), Salvelinus Alpinus.

Char (245) were caught by gill nets in 1963 and 1965 (in Lake Nordiaguna, Norway). Two size groups of adults, mature small char and large cannibals, were found. Young char fed on small benthic species (e.g. Chricotopus basalis). When the char became too large in relation to the prey, they turned to non-selective deposit feeding. Mortality was high after the 10th winter, probably due to starvation. Some char lived considerably longer because they had become cannibals. The char started to mature sexually at ages from 3-7 winters. Cannibalism probably caused the char to enter a new growth period and to remature at 12-14 winters.—Copyright 1974, Biological Abstracts, Inc.

THE INFLUENCE OF EUTROPHIC LAKE SEDIMENTS ON THE GROWTH OF DIFFERENT PLANKTONIC ALGAE, Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
P. Javornicky, and C. R. Goldman.
Arch Hydrobiol Supplement B. Vol 41, No 3, p 341-362. 1973.

Descriptors: *Lake sediments, Plankton, Algae, Phytoplankton, Eutrophication.

The sediments of Clear Lake (California, USA) enrich the lake water under fully aerobic conditions by all nutrients required by planktonic cyanophyta, Chlorophyta and diatoms. Because of originally high P concentrations in inlet and lake water, the enrichment by N and Fe from sediments promotes the most intensive stimulation of phytoplankton growth. Concerning the specific requirements and the possible selective influence of sediments on phytoplankton population dynamics, the effect of P, N and Fe on the growth of Aphanizomenon flos-aquae, Microcystis aeruginosa, Oscillatoria limnetica, Nitzschia kuetzingiana, Navicula pelliculosa, Chlorella minuitsisma and Scenedesmus intermedius. —Copyright 1974, Biological Abstracts, Inc.

WATER QUALITY IN THE GREAT LAKES: A NEW TIMETABLE, For primary bibliographic entry see Field 5G. W75-05694

NUMBER, BIOMASS AND PRODUCTION OF PLANKTONIC BACTERIA IN THE SHALLOW LAKE BALATON, Fisheries Research Inst., Szarvas (Hungary).

J. Olah. Arch Hydrobiol, Vol 73, No 2, p 193-217, 1974. Illus.

Descriptors: *Biomass, *Plankton, *Primary productivity, Lakes, Hungary. Identifiers: Lake Balaton.

A detailed temporal and spatial analysis on the heterotrophic and total bacteroplankton was carried out in the shallow Lake Balaton. Significant daily, seasonal and yearly fluctuations were found in the number, biomass and production of the bacterioplankton. The vertical distribution is unstable except the stratification under ice. A definite differentiation was found between the littoral zone and the ocean water. Depending on the self-purification capacity of lake water, the river influence changes seasonally.—Copyright 1974, Biological Abstracts, Inc. W75-05719

REPORT ON ESTES LAKE, YORK COUNTY, MAINE.

Pacific Northwest Environmental Research Lab., Corvallis, Oreg. For primary bibliographic entry see Field 5C. W75-05729

REPORT ON BAY OF NAPLES AND SEBAGO LAKE, CUMBERLAND COUNTY, MAINE, Pacific Northwest Environmental Research Lab., Corvallis, Oreg. For primary bibliographic entry see Field 5C. W75.05731

REPORT ON RANGELEY LAKE, FRANKLIN COUNTY, MAINE, Pacific Northwest Environmental Research Lab., Corvallis, Oreg. For primary bibliographic entry see Field 5C. W75-05732

REPORT ON LONG LAKE, AROOSTOOK COUNTY, MAINE, Pacific Northwest Environmental Research Lab., Corvallis, Oreg. For primary bibliographic entry see Field 5C. W75-05733

REPORT ON MATTAWAMKEAG LAKE, AROOSTOOK COUNTY, MAINE, Pacific Northwest Environmental Research Lab., Corvallis, Oreg. For primary bibliographic entry see Field 5C. W75-05734

A MATHEMATICAL MODELLING OF LAKE ECOLOGICAL SYSTEMS, For primary bibliographic entry see Field 5C. W75-05744

PHYSICO-CHEMICAL REGIME AND BIOPRODUCTIVE PROCESSES IN LAKE SEVAN (ARMENIA) IN TRANSITION FROM OLIGOTROPHY TO EUTROPHY, For primary bibliographic entry see Field 5C. W75-05747

VERTICAL PATTERNS OF PRIMARY PRODUCTIVITY IN CASTLE LAKE, CALIFORNIA, For primary bibliographic entry see Field 5C. W75.07575

NEARSHORE ZOOPLANKTON OF SOUTHEASTERN LAKE MICHIGAN, 1972, Michigan Univ., Ann Arbor. Great Lakes Research Div. For primary bibliographic entry see Field 5C. W75-05761

DENITRIFICATION IN INDIANA LAKE, RESERVOIR, AND POND SEDIMENTS, Purdue Univ., Lafayette, Ind. For primary bibliographic entry see Field 5B. W75-05785

EUTROPHICATION IN THE HIGH ARCTIC-MERETTA LAKE, CORNWALLIS ISLAND (75 DEGREE N LAT.), Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. For primary bibliographic entry see Field 5C. W75-05799

DIATOMS IN LAKES AND LAKE SEDIMENTS AS AN INDEX TO ENVIRONMENT. PART 1. DIATOM STRATIGRAPHY AND HUMAN SET-TLEMENT IN MINNESOTA, Minnesota Univ., Minneapolis. For primary bibliographic entry see Field 5C. W75-05805

THE PHOSPHORUS-CHLOROPHYLL RELA-TIONSHIP IN LAKES, Toronto Univ. (Ontario). Dept. of Zoology. P. J. Dillon, and F. H. Rigler. Limnology and Oceanography, Vol 19, No 5, p 767-773, September 1974. 1 fig, 4 tab, 21 ref.

Descriptors: *Chlorophyll, *Mathematical models, *Nutrients, *Nitrogen, *Phosphorus, *Phytoplankton, Aquatic environment, Eutrophication, *Lakes, North America, Trophic level, Watershed management, Summer, *Canada, Lake morphometry, Methodology. Identifiers: Ontario.

A methodology for predicting the average summer chlorophyll concentration in North American lakes from single measurements of phosphorus concentrations at spring overturn was proposed. Data for summer chlorophyll and spring total phosphorus concentrations were collected from 19 lakes in southern Ontario and combined with data reported in the literature for other North American lakes to produce a regression line that can be used to make such predictions. Until the model can be further generalized, its application may be limited, but it offers the obvious advantages of speedy results and economy of sampling. Values for both 50% and 95% confidence limits were listed. The predictive equation was not significantly different from a previously published phosphorus-chlorophyll relationship derived for a number of Japanese lakes, although the methods of determining chlorophyll concentrations may have been. (Harmeson-ISWS) W75_05837

POND PHYTOPLANKTON OF THE TEDZHEN FISH-BREEDING FARM. (IN RUSSIAN), Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki. Yu. E. Lyubeznov.

Izv Akad Nauk Turkm SSR Ser Biol Nauk. 5 p 55-61. 1973 Illus. (English Summary).

Descriptors: *Phytoplankton, *Fish farming, USSR, Fish reproduction.

Phytoplankton of 2 fish-breeding ponds (Turkmen SSR, USSR) includes 203 spp., varieties and forms of algae. Application of mineral fertilizers increases the number and biomass of phytoplankton algae by 10 times and above.—Copyright 1974, Biological Abstracts, Inc. W75-03830

2I. Water In Plants

PHYSIOLOGICAL EFFECTS OF WATER STRESS ON YOUNG CORN PLANTS, Oregon State Univ., Corvallis. Dept. of Soils. E. W. R. Barlow.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 027, \$5.75 in paper copy, \$2.25 in microfiche. Ph.D. Thesis, June 1974, 128 p, 25 fig, 10 tab, !24 ref, 4 append. OWRT B-028-ORE(4).

Descriptors: *Photosynthesis, *Plant growth, *Crop production, *Corn(Field), Transpiration, Leaves, *Plant physiology, Growth rates. Identifiers: *Leaf water potential.

Laboratory experiments were used to investigate the mechanisms of plant response to water stress by determining the sensitivity of leaf elongation, photosynthesis and transpiration in young corn plants to a decrease in leaf water potential. The

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sensitivity of leaf elongation to mild water stress and its subsequent effect on photosynthesis in-dicates that plant growth and production may be limited by mild stress in the field situation. The vegetative growth of plants depends on both the photosynthetic rate and the rate of increase of the photosynthetic surface area. The response of leaf enlargement to water stress in the field warrants thorough further investigation. W75-05450

FACTORS AFFECTING THE ESTABLISHMENT OF DIRECT-SEEDED PINE ON SURFACE-MINE SPOILS,

Forest Service (USDA), Princeton, W. Va. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4D. W75-05493

QUALITATIVE STUDY OF THE NUTRITION OF ALESTES BAREMOZE (PISCES, OF ALESTES CHARACIDAE),

L. Lauzanne Cah ORSTOM Ser Hydrobiol. Vol 7, No 1, p 3-15. 1973 Illus.

Identifiers: *Alestes-Baremoze, Aquatic insects, Characidae, Crustaceaus, Nutrition, Pisces, Plankton, Spawning, *Lake Chad, *Fish diets, *Chad(Chari-Logone rivers).

The A. baremoze of the lower Chari, lower Logone and Lake Chad make a spawning run which leads them to very different surroundings. Their diet was qualitatively studied in the different areas where they live. Plenty of food was found, except when the adults go up-stream during low water. Their diet mainly consisted of planktonic crustaceans and small aquatic insects. In the rivers, however, during the flood, adults become herbivorous. —Copyright 1974, Biological Abstracts. Inc. W75-05512

EFFECT OF POTASSIUM CHLORIDE AND PHENYLMERCURIC ACETATE ON THE REGULATION OF STOMATAL OPENING AND WATER ECONOMY IN TEPHROSIA PURPUREA PERS, Jodhpur Univ., (India). Dept. of Botany. For primary bibliographic entry see Field 2D. W77.40538

W75-05538

DROUGHT ADAPTATION IN OPUNTIA BASILARIS: SIGNIFICANCE OF RECYCLING CARBON THROUGH CRASSULACEAN ACID METABOLISM.

California Univ., Riverside. Dept. of Biology. S. B. Szarek, H. B. Johnson, and I. P. Ting. Plant Physiol Vol 52, No 6, p 539-541, 1973. Illus. Identifiers: Carbon recycling(Plants), Crassulacean-acid, Drought adaptation(Plants),
*Metabolism, *Opuntia-basilaris, Photosynthesis,
Respiration, Transpiration, *Carbon dioxide
exchange, Organic acids.

Contrasting metabolic regimes operate in Opuntia basilaris Engelm. et Bigelov, before and after precipitation. During periods of drought, at-mospheric CO2 exchange and transpiration are mospheric CO2 exchange and transpiration are greatly reduced throughout the day/night cycle by stomatal closure and a highly impervious cuticle. The hypothesis is that endogenously produced CO2 is retained and recycled through dark CO2 fixation, organic acid transformations, photosynthesis, and respiration. Immediately following precipitation, nighttime stomatal opening is initiated, permitting increased atmospheric CO2 assimilation and organic acid synthesis.—Copyright 1974, Biological Abstracts, Inc. W75-05547

EFFECTS OF AMMONIUM NUTRITION ON WATER STRESS, WATER UPTAKE, AND

ROOT PRESSURE IN LYCOPERSICON ESCU-

LENTUM MILL, Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Central Research Dept. For primary bibliographic entry see Field 3F. W75-05548

INFLUENCE OF MOISTURE, HEAT AND LIGHT STRESS ON HYDROGEN FLUORIDE FUMIGATION INJURY TO SOYBEANS, Utah State Univ., Logan. Dept. of Botany. For primary bibliographic entry see Field 3F. W75-05588

TOXICITY OF ACID COAL-MINE SPOIL TO

PLANTS, Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 5C. W75-05591

CHEMISTRY OF THROUGHFALL UNDER DOUGLAS FIR AND ROCKY MOUNTAIN JU-

NIPER, Utah State Univ., Logan. Dept. of Forest Science. G. E. Hart, and D. R. Parent. The American Midland Naturalist Vol 92, No 1, July 1974, p 191-201, 2 fig, 5 tab, 13 ref.

Descriptors: *Throughfall, Trees, *Douglas fir trees, *Juniper trees, *Chemistry of precipitation, *Utah, Rocky Mountain region. Identifiers: Semi-arid region

Chemical concentrations of sodium, calcium, magnesium, potassium, phosphorus, and nitrate nitrogen were measured in throughfall under iso-lated douglas fir and Rocky Mountain juniper trees in northern Utah. Concentrations were 3 to 16 times greater under the trees than in the open. Throughfall under douglas fir invariably had higher concentrations than that under juniper. Since most of the chemical input occurs as dry fallout between storms, surface area and form of the canopy is believed to be the prime factor influencing throughfall chemistry in semi-arid regions. W75-05685

MULTIVARIATE ANALYSIS OF DESERT VEGETATION III. THE RELATION OF VEGETATION UNITS TO HABITAT CLASSES, Univ., Jerusalem (Israel). Dept. of Botany.

Botany.

I. Noy-Meir, G. orshan, and N. H. Tadmor.

Isr J Bot Vol 22, No 4, p 239-257, 1973.

Identifiers: Deserts, Habitat classes,

*Israel(Negev desert), Moisture, *Multi-variate
analysis, Regression analysis, Soil structure,

Forecasting, *Vegetation(Desert).

The association between vegetation units and habitats in a transect across a hill of arid shrubland at Avedat (rainfall 80 mm, altitude 550 m) in the Negev (Israel) was examined by 2 statistical Negev (Israel) was examined by 2 statistical methods for selecting best predictors: stepwise binary multiple regression (BMR) and predictive attribute analysis (PAA). Two types of vegetation unit were used, defined by association analysis of floristic data and by dominance, respectively. High predictability (R2 greater than or equal to 0.8) was attained for all dominance units and for most major association analysis units. PAA gives somewhat more meaningful results than BMR. Several limitations on direct causal interpretation of the results from both methods are discussed. Topographical attributes are more often better Topographical attributes are more often better predictors than edaphic ones, but the interpretation takes into account the correlations and interactions between both. The distribution of the major floristic units is explained mainly by the interacting effects of topographic position (runoff), surface stoniness (infiltration) and soil stoniness (Moisture capacity) on the depth of wetting and the vertical distribution of soil moisture. In particular, the floristic unit characterized by Helianthemum kahiricum is strongly associated with slopes of stony surface where a hard and fissured rocky layer is close to the surface, so that a substantial amount and proportion of available moisture is in or below it.—Copyright 1974, Biological Abstracts, Inc. W75-05698

CADMIUM IN PLANTS, Geological Survey, Denver, Colo. H. T. Shacklette. Bulletin 1314-G, 1972, 28 p, 2 fig, 2 tab, 47 ref.

Descriptors: *Cadmium, *Plant tissues, *Distribution, Plant physiology, Absorption, Industrial wastes, Trace elements, Air pollution, Testing procedures, Analytical techniques, Spectroscopy, Soils, *Pollutant identification.

Cadmium in low concentrations most likely is a normal constituent of all plant tissues. The con-centration in the tissue is determined by the in-herent ability of a plant species to absorb cadmium and by the cadmium concentration in the environ-ment. Differences in cadmium content among plants of different species growing in low-cadmi-um soils commonly are greater than differences in amounts of cadmium in the soils. The cadmium content of plant tissue tends to increase with in-crease of concentrations of soil cadmium above certain background amounts. Airborne cadmium, originating in emissions from the combustion of hydrocarbons or from certain industrial processes, may enter the soil and be absorbed by plants or may be deposited on the surface of plants in parmay be deposited on the surface of piants in par-ticulate matter until very high levels of cadmium are accumulated by the plants. Spanish moss, a plant with no connection to the soil, seems to be a useful indicator of the relative extent of airborne useful indicator of the relative extent of airborne cadmium pollution, in that it contains much more cadmium if growing in areas remote from sources of pollution. There seems to be no natural means by which cadmium is eliminated from plant tissue, and no cultural practice has been found to be effective in reducing or preventing the absorption of cadmium by plants. (Jernigan-Vanderbilt) W75-05709

USE OF REMOTE SENSING FOR VEGETA-TION INVENTORIES IN A DESERT SHRUB COMMUNITY,

Arizona Univ., Tucson. Dept. of Watershed Management. For primary bibliographic entry see Field 7B. W75-05721

SOME REGULARITIES OF THE XERO-PHILIZATION OF PLANTS. (IN RUSSIAN), Leningrad State Pedagogical Inst. (USSR). Dept. of Botany. G. N. Solonko. Biol Nauki. Vol 17, No 1, p 53-58. 1974 Illus.

Descriptors: *Xerophytes, *Drought resistance, *Transpiration. Identifiers: Festuca.

A comparative study of 5 spp. of fescue (Festuca gigantea, F. pratensis, F. rubra, F. ovina, F. sulcata) showed that these species comprise a series of sequential stages of xerophilization, the drought resistance, gradually increasing from the first to the last species in the series. The increase of drought resistance is closely related with a gradual change of a number of adaptive features, the most important ones being: a decrease of the size and reorganization of the leaf; marked reduction of the transpiring surface of the plants: decrease of the transpiring surface of the plants; decrease of the transpiring surface of the plants; decrease of the precocity of the plants and hence the possibility of shortening their normal vegetative period. Economical transpiration is thought to be the most important factor of the drought resistance of plants.—Copyright 1974, Biological Abstracts, Inc. W75-08800

Erosion and Sedimentation—Group 2J

2J. Erosion and Sedimentation

MINERALOGY AND ION EXCHANGE CHARACTERISTICS OF SAVANNAH RIVER PLANT STREAMBED SEDIMENTS,

Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab. For primary bibliographic entry see Field 5B. W75-05389

EROSION OVER TIME ON SEVERELY DISTURBED GRANITIC SOILS: A MODEL, Forest Service (USDA), Boise, Idaho. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-05499

MINERALOGY OF SUSPENDED SEDIMENT AND CONCENTRATION OF FE, MN, NI, ZN, CU, AND PB IN WATER AND FE, MN, AND PB IN SUSPENDED LOAD OF SELECTED KANSAS

Kansas Univ., Lawrence. Dept. of Geology; and Kansas Univ., Lawrence. Dept. of Civil Engineer-

For primary bibliographic entry see Field 5B. W75-05521

CHARACTERIZATION OF CADMIUM AND NICKEL CONTAMINATED SEDIMENTS FROM FOUNDRY COVE, NEW YORK, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W75-05579

THE PORE WATER CHEMISTRY OF RECENT SEDIMENTS IN THE WESTERN MEDITER-RANEAN BASIN,

Institut de Physique de Globe, Paris (France). For primary bibliographic entry see Field 5B. W75-05587

STRIP-MINING, EROSION AND SEDIMENTA-

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 5C.
W75-05600

VEGETATING STRIP-MINE SPOILS FOR RU-NOFF AND EROSION CONTROL, Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4D. W75-05603

RECURRENT GEOTHERMALLY INDUCED DEBRIS AVALANCHES ON BOULDER GLACIER, MOUNT BAKER, WASHINGTON, Geological Survey, Tacoma, Wash. D. Frank, A. Post, and J. D. Friedman.

D. FTRIK, A. Post, and J. D. Friedman. Available from the Superintendent of Documents, GPO, Washington, DC 20402, \$3.15. Journal of Research of the U.S. Geological Survey, Vol 3, No 1, p 77-87, January-February 1975. 8 fig, 2 tab, 17 ref.

*Washington, *Avalanches. Descriptors: *Geothermal studies, *Debris avalanches, Mass wasting, Landslides, Mudflows, Glaciers, Melting. Identifiers: *Mt. Baker(Wash).

Avalanches of snow, firn and hydrothermally altered rock and mud have been released six times since 1958 from Sherman Peak, south of the main summit of Mount Baker, Wash. The avalanches traveled nearly identical paths 2.0-2.6 km down Boulder Glacier on the east slope of the volcano. Fumaroles, thermal springs, and areas of warm ground, some of which are subglacial, are concentrated in the crater and were mapped by aerial infrared thermography. The outgoing radiant flux per unit area from a cluster of infrared anomalies within 50-150 m of the avalanche source was estimated to be 319 W per sq m in November 1972, which is sufficient to account for observed ice perforations. In addition, vapor emission (not apparent in thermography was observed along the source margin after the avalanche of August 1973. The principal conditions that produce the avalanches are the large accumulation of snow and firn on top of hydrothermally altered clay-rich ground and the saturation near the ground-firn interface by melt water produced both by summer snow ablation and by geothermal emission. The periodic avalanches have a potential a potential for impounding water in the crater. Sudden release of impounded water could present a danger to the Boulder Creek valley below. (Knapp-USGS)

THE SCAVENGING OF SILVER BY MAN-GANESE AND IRON OXIDES IN STREAM SEDIMENTS COLLECTED FROM TWO DRAINAGE AREAS OF COLORADO,

Geological Survey, Denver, Colo. T. T. Chao, and B. J. Anderson. Chemical Geology, Vol 14, No 3, p 159-166, November 1974. 2 fig, 1 tab, 20 ref.

Descriptors: "Water chemistry, "Sediments, "Colorado, "Manganese, "Iron oxides, Ion exchange, Adsorption, Chemical precipitation, Diffusion, Chemistry of precipitation, Oxides. Identifiers: *Silver.

Stream sediments of two well-weathered and aerated drainage areas of Colorado containing anomalous amounts of silver were allowed to react by shaking with nitric acid of different concentra-tions (1-10M). Silver, manganese, and iron simul-taneously dissolved were determined by atomic absorption. The relationships between silver dissolution and the dissolution of manganese and iron were evaluated by linear and multiple regression analyses. The highly significant correlation coefficient (r = 0.913) between silver and manganese dissolution suggests that manganese oxides are the major control on the scavenging of silver in these stream sediments, whereas iron oxides only play a secondary role in this regar. (Knapp-USGS) W75-05652

THE WATER QUALITY AND BOTTOM SEDI-MENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS, Rutgers - the State Univ., New Brunswick, N.J.

Dept. of Soils and Crops.
For primary bibliographic entry see Field 5B.
W75-05658

A STUDY OF BENTHIC INVERTEBRATES IN LAGOON SYSTEMS IN THE SALT MARSHES OF NEW JERSEY, Rutgers - the State Univ., New Brunswick, N.J.

Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W75-05664

ORIGIN OF METALLIFEROUS SEDIMENTS

FROM THE PACIFIC OCEAN, Oregon State Univ., Corvallis. School of Oceanography.
J. Dymond, J. C. Corliss, G. R. Heath, C. W. Field,

and E. J. Dasch. Geological Society of America Bulletin, Vol 84, No 10, p 3355-3371, October, 1973. 7 tab, 9 fig, 57

Descriptors: *Sediments, *Heavy metals, *Pacific Ocean, *Water pollution sources, Iron, Man-ganese, Lead, On-site data collections, On-site tests, Oxygen isotopes, Sea water, Basalts, Rocks.

All the sediments studied from the Bauer Deep and East Pacific Rise had rare-earth-element (REE) patterns strongly resembling the pattern of sea water, implying that the REE's were coprecipitated with ferromanganese hydroxyoxides, or that they were incorporated in small con-centrations of phosphatic fish debris found in all samples. Oxygen isotopic data indicated that the metalliferrous sediments are in isotopic equilibrium with sea water and are composed of varying mixtures of two end-member phases with different oxygen istopic compositions: an iron-manganese hydroxyoxide and an iron-rich montmorillonite. A low-temperature origin for the sediments is supported by mineralogical analyses by X-ray diffraction which showed that geothite, iron-rich montmorillonite and various manganese hydroxyoxides are the dominant phases present. Ratios of lead isotopes in the metalliferrous deposits resembled values for oceanic theolite basalt, but were quite different from ratios found in authogenic marine manganese modules. Lead in the metalliferrous sediment appears to be of magnetic origin. The combined mineralogical, isotopic, and chemical data for these sediments suggest that they formed from hydrothermal solutions generated by the interactions of sea water with newly formed basalt crust at mid-ocean ridges. (Jernigan-Vanderbilt)

EROSION CONTROL ON LOGGING ROADS IN

THE APPALACHIANS,
Forest Service (USDA), Parsons, W. Va. Timber and Watershed Lab. J. N. Kochenderfer

Research Paper NE-158, 1970. 28 p. 21 fig, 11 ref.

Descriptors: *Roads, Soil erosion, *Erosion control, *Lumbering, Planning, Drainage, Main-

Practical methods of controlling erosion on logging rracucar methods or controlling erosion on logging roads are summarized through the different stages—planning, location, drainage, maintenance and care after logging. The material was derived from existing literature, road lore, contact with experienced land managers, and personal experience. (Forest Service)
W75-05713

SUSPENDED-SEDIMENT TRANSPORT RELA-TIONSHIPS FOR FOUR ALASKAN GLACIER STREAMS.

Alaska Univ., College. Dept. of Geohydrology. B. L. Gaddis.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 294, \$5.25 in paper copy; \$2.25 in microfiche. M S Thesis, August 1974, 102 p. 18 fig, 5 tab, 74 ref, 2 append. OWRR A-042-ALAS(3). Phase I 14-31-0001-3802, Phase II 14-31-0001-4002.

Descriptors: *Suspended sediments, *Glacier sediments, Melt water, *Sediment transport, *Suspended load, Mathematical models, Simulation analysis, Sediment discharge, Sediment sam-pling, Streams, Water sources, *Alaska, Model

Identifiers: Gulkana Glacier(Alas), Maclaren Gla-cier(Alas), Eklutna Glacier(Alas), Wolverine Glacier(Alas), Rock flow.

Estimates of suspended-sediment transport for four Alaskan glacier streams were made for the 1973 summer melt season. Two types of field data are requisite for establishing linear models relating discharge and suspended-sediment concentration: (1) suspended-sediment concentration and corresponding discharge measurements, and (2) a seasonal discharge record. Comparison of monthly percentages of season total discharge and suspended-sediment transport suggest that variations between discharge and suspended-sediment transport magnitudes depend primarily on sedi-ment availability. Changes in sediment availability are qualitatively discussed in relation to the glacier

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drainage system. Sediment availability differences between glaciers are attributed to meteorological changes affecting the discharge, variation in the mechanics of sediment entrainment, and the differences in the amount of sediment for transport.
The procedures presented for estimating suspended-sediment transport for a melt season remain similar for glaciers that have a defined glacier streams(s) issuing from the terminus, regardless of climatic or regional setting. W75-05762

DENITRIFICATION IN INDIANA LAKE, RESERVOIR, AND POND SEDIMENTS, Purdue Univ., Lafayette, Ind. For primary bibliographic entry see Field 5B. W75-05785

EROSION EFFECT ON SOIL FAUNA UNDER DIFFERENT CROPS, Akademiya Nauk Litovskoi SSR, Vilnius. Institut

Zoologii i Parazitologii. O. Atlavinyte, Z. Kuginyte, and S. Pileskis. Pedobiologia. Vol 14, No 1, p 35-40. 1974 Illus.

Descriptors: *Soil erosion, Annelids.

The most intense soil erosion took place in fallow and arable soil. In soils under sod and perennials after 2 yr, when grasses took on firm roots, erosion stopped altogether. The intensity of soil erosion is not directly proportional to the inver-tebrates that are carried away. When soil erosion is proceeding slowly earthworms are carried away by the flowing water. More earthworms are carried away during the 2nd and 3rd showers, though they are less intense than the 1st ones. During 5 yr of investigations the following percentage of earthworms was carried away in soils under different cover: 36.2% in fallow, 16.9% in arable soil; fewer earthworms were carried away in soils under perennials and sod, 7.6 and 4.5%, respectively. Insect larvae that were carried away made up 1.2-4.9%. Each year imago forms of insects carried away made up almost the same amount. They were also more numerous in fallow and arable soil. Arionidae were carried away diring the 1st and 2nd year and in drought years they were not found. The average biomass carried away was 2.7 g/m2.--Copyright 1974, Biological Abstracts, Inc. W75-05793

TRANSPORT OF SUSPENDED SOLIDS ALONG

THE VISTULA RIVER, Panstwowy Instytut Hydrologiczno-Meteorolog-iczny, Warsaw (Poland). J. Branski.

Nordic Hydrology, Vol 5, No 3, p 183-192, 1974. 2

Descriptors: *Suspended solids, *Sediment transport, "Erosion, "Monitoring, Methodology, Rivers, Evaluation, Reservoirs, Erosion rates, Stream stabilization, Sediment yield. Identifiers: "Vistula River, Denudation indices, Fluvial hydraulics, *Poland.

A method is described for preparing a balance of transported solids along the Vistula river on the basis of many years' monitoring and observations of transportation of suspended solids. This method is based on direct monitoring of the transported solids and denudation indices determined for nonobserved areas of the river basin. The Vistula balance was shown in tables and on a graph. The individual sections of the Vistula river bed were also characterized from the viewpoint of its stability. Working out the balance in this way permits general evaluation of the denudation processes in the river basin; the mean denudation index of the Vistula river basin was calculated with regard to the volume of solids sedimented in water reservoirs. (Singh-ISWS) W75-05828

MOSQUITO LAGOON BARRIER BEACH

STUDY, Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W75-05829

2K. Chemical Processes

EXTRACTION OF COBALT, IRON, INDIUM AND ZINC FROM SEAWATER BY MEANS OF TRIFLUOROACETYLACETONE TOLUENE SYSTEM,

Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 5A. W75-05404

DETERMINATION OF HEAVY METALS IN SEAWATER BY CARBON FILAMENT ATOMIC SPECTROMETRY,

Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 5A. W75-05405

DIRECT PHOTOMETRIC DETERMINATION DIRECT PHOTOMETRIC DETERMINATION
OF SOLUBLE PROTEINS IN NATURAL
WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut
Hidrobiologii.

E. V. Debeiko, A. K. Ryabov, and B. I.

Nabivanets. Gidrobiol Zh. 9(6): 109-113, Illus. 1973. Identifiers: Enzymes, Freezing-out method, *Microbiological studies, Natural waters, *Photometric method, *Proteins(Soluble), Water method.

analysis, Pollutant identification. Described are the reagents and method of analysis

for direct determination of soluble proteins in natural waters by the photometric method. Freezing-out was used as the method of concentration, since a low temperature reduces possible losses of protein as a consequence of its destruction under the effect of enzymatic and micro-biological processes. A check of the method on various water samples showed that small systematic errors occur during freezing-out and passage through filter paper.--Copyright 1974, Biological Abstracts. Inc. W75-05409

TRANSPORT FATE AND GEOCHEMICAL IN-TERACTIONS OF MERCURY, CADMIUM AND OTHER INORGANIC POLLUTANTS IN THE COASTAL LITTORAL-SALT MARSH EN-VIRONMENT OF THE SOUTHEASTERN UNITED STATES.

Skidaway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 5B. W75-05416

THERMODYNAMIC STUDIES OF THE EF-FECTS OF SOLVENTS ON MOLECULAR COM-PLEX FORMATION EQUILIBRIA; ORIENTA-TION OF WATER AROUND NONPOLAR SOLUTES IN AQUEOUS SOLUTIONS, Oklahoma Univ., Norman. Graduate Coll. For primary bibliographic entry see Field 1B. W75-05447

FLAMELESS ATOMIC ABSORPTION DETER-MINATION OF COBALT NICKEL, AND COPPER - A COMPARISON OF TANTALUM MOLYBDENUM EVAPORATION SUR-

AND FACES, Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research For primary bibliographic entry see Field 5A. W75-05487

SOLVENT EXTRACTION FOR USE WITH FLAME ATOMIC ABSORPTION SPECTROMETRY, Toronto Univ., (Ontario). Dept. of Geology. For primary bibliographic entry see Field 5A. W75-05488

COMPARISON OF CONTINUOUS WAVE AND CONTINUUM SOURCES FOR FLUORESCENCE FLAME SPEC-PULSED ATOMIC TROMETRY, Florida Univ., Gainesville. Dept. of Chemistry.

For primary bibliographic entry see Field 5A. W75-05489

AVOID PROBLEM SPOILS THROUGH OVER-BURDEN ANALYSIS,

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 5A. W75-05494

MINERALOGY OF SUSPENDED SEDIMENT AND CONCENTRATION OF FE, MN, NI, ZN, CU, AND PB IN WATER AND FE, MN, AND PB IN SUSPENDED LOAD OF SELECTED KANSAS

Kansas Univ., Lawrence. Dept. of Geology; and Kansas Univ., Lawrence. Dept. of Civil Engineer-For primary bibliographic entry see Field 5B.

W75-05521

ANALYSIS OF GROUND-WATER REGIMES BY USE OF NATURAL URANIUM ISOTOPE VARIATIONS.

Florida State Univ., Tallahassee. Dept. of Geolo-

or primary bibliographic entry see Field 2F. W75-05535

THE PORE WATER CHEMISTRY OF RECENT SEDIMENTS IN THE WESTERN MEDITER-RANEAN BASIN.

Institut de Physique de Globe, Paris (France). For primary bibliographic entry see Field 5B. W75-05587

CHEMICAL HYDROGEOLOGY OF THE CAR-BONATE PENINSULAS OF FLORIDA AND YU-CATAN.

Nevada Univ., Reno. For primary bibliographic entry see Field 2F. W75-05614

BIOLOGICAL POLLUTION INDICATORS IN UNDERGROUND WATERS. (IN SLOVENIAN), Kemijski Institut Boris Kidric, Ljubljana (Yugoslavia). For primary bibliographic entry see Field 5A.

EFFECT OF CO2 ON THE CHEMICAL EQUIL-LIBRIUM OF SOIL SOLUTION AND GROUND WATER.

W75-05616

Arizona Univ., Tuscon. Dept. of Hydrology. For primary bibliographic entry see Field 2G. W75-05623

WATER-QUALITY CHANGES DURING A SAL-MON RUN IN AN INTERIOR ALASKAN STREAM,

Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 5B. W75-05628

HYDROGEOCHEMISTRY OF THE NORTHERN YUCATAN PENINSULA, MEXICO, WITH A SECTION ON MAYAN WATER PRACTICES, Geological Survey, Reston, Va. For primary bibliographic entry see Field 2F. W75-05647

THE SCAVENGING OF SILVER BY MAN-GANESE AND IRON OXIDES IN STREAM SEDIMENTS COLLECTED FROM TWO DRAINAGE AREAS OF COLORADO, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 2J. W75-05652

HYDROLOGY AND PHYTOPLANKTON OF A CONTINENTAL SHELF TRANSECT OF CAMPECHE BAY, MEXICO (AUGUST, 1972). (IN SPANISH). Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Biologia. For primary bibliographic entry see Field 2L. W75-05673

CHEMISTRY OF THROUGHFALL UNDER DOUGLAS FIR AND ROCKY MOUNTAIN JU-

Utah State Univ., Logan. Dept. of Forest Science. For primary bibliographic entry see Field 2I. W75-05685

CATION EXCHANGE CHARACTERISTICS OF SOME METAL IONS IN NITRIC ACID-AM-MONIUM ACETATE MEDIUM, Allahabad Univ. (India). Chemistry Labs. For primary bibliographic entry see Field 5A. W75-05686

ORIGIN OF METALLIFEROUS SEDIMENTS FROM THE PACIFIC OCEAN, Oregon State Univ., Corvallis. School of Oceanography. For primary bibliographic entry see Field 2J. W75-05701

DIRECT DETERMINATION OF GOLD, COBALT, AND LITHIUM IN BLOOD PLASMA USING THE MINI-MASSMANN CARBON ROD ATOMIZER, Amsterdam Univ. (Netherlands). Lab. for Analyti-

cal Chemistry.
For primary bibliographic entry see Field 5A.
W75-05702

SPECTROPOLARIMETRIC DETERMINATION OF COPPER (II), NICKEL (II) AND IRON (III) IONS WITH N-CARBOXYMETHYLPYR-ROLIDINE-2-CARBOXYLIC ACID, Turin Univ. (Italy). Istituto di Chimica Analitica.

P. Mirti. Analytica Chimica Acta, Vol 69, No 1, p 69-77, March, 1974. 7 fig, 4 tab, 10 ref.

Descriptors: *Volumetric analysis, *Analytical techniques, *Polarographic analysis, *Copper, *Nickel, *Iron, Ions, Chelation, Colorimetry, Spectroscopy, Chemical analysis.
Identifiers: Ligands, Spectropolarimetry.

The necessary conditions for the polarimetric titration of metal ions with an optically active titrant are: (1) the stability constant of the complex formed must be high enough to allow determina-tion of the metal ion under the experimental condition of the metal ion under the experimental condi-tions; and (2) the molar rotations of the ligand and of the complex must be different enough to permit a good appreciation of the end-point. This last con-dition affects the selection of the proper wave-length at which to carry out the titration. Another consideration is that regions of high absorbance must be avoided, because this could decrease the

sensitivity of the detection. This study suggested N-Carboxymethyl pyrrolidine-2-carboxylic acid (CMPCA) as an optically active titrant. The values of the acidity constants of the ligand were deter-mined and the order of magnitude of the stability constants of the complexes formed by CMPCA with some metal ions was evaluated. In order to determine the best conditions for the spectropolarimetric titrations, the dependence of the molar rotation of CMPCA and its complexes on wavelength and pH was examined. The spec-tropolarimetric titrations of copper (II), nickel (II), and iron (III) ions were carried out successfu Titrations of other metal ions, such as cobalt (II) and zinc (II) were tested, but the results were unsatisfactory. (Pulliam-Vanderbilt) W75-05704

2L. Estuaries

OF RESPONSE NEARSHORE THE RESULTION OF THE RESULTION OF THE RESULTION OF THE RESULT OF THE RESULTIONS, Minnesota Univ., Minneapolis. School of Public

For primary bibliographic entry see Field 5C. W75-05354

NITROGEN BUDGET OF A NORTH CAROLINA ESTUARY. North Carolina State Univ., Raleigh. Dept. of Zoology. For primary bibliographic entry see Field 5B. W75-05357

THE THREE DIMENSIONAL HEATED SUR-FACE JET IN A CROSS FLOW, Johns Hopkins Univ., Baltimore. Chesapeake Bay Inst. For primary bibliographic entry see Field 5B. W75-05360

TRACE METAL ASSOCIATIONS IN SUB-ARC-TIC FJORD ENVIRONMENTS, PROGRESS RE-PORT MAY 1972-MARCH 1974, Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 5B. W75-05403

DETERMINATION OF BUDGETS OF HEAVY METAL WASTES IN LONG ISLAND SOUND, ANNUAL REPORT, PART I, Connecticut Univ., Groton. Marine Sciences Inst. For primary bibliographic entry see Field 5B. W75-05410

DETERMINATION OF BUDGETS OF HEAVY METAL WASTES IN LONG ISLAND SOUND, ANNUAL REPORT, PART II, Connecticut Univ., Groton. Marine Sciences Inst. For primary bibliographic entry see Field 5B. W75-05411

TRANSPORT FATE AND GEOCHEMICAL INTERACTIONS OF MERCURY, CADMIUM AND OTHER INORGANIC POLLUTANTS IN THE COASTAL LITTORAL-SALT MARSH ENVIRONMENT OF THE SOUTHEASTERN HINTER STATES VIRONMENT OF UNITED STATES.

Skidaway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 5B. W75-05416

THE INFLUENCE OF BIG CYPRESS LAND DEVELOPMENT IN THE DISTRIBUTION OF HEAVY METALS IN EVERGLADES ESTUA-

RIES, Florida State Univ., Tallahassee. Marine Lab. For primary bibliographic entry see Field 5B. W75-05434

THE VITAL ROLE OF PROTOZOA IN MOBILE BAY, Organization University of South Alabama, Mo-

bile. Dept. of Biological Sciences. E. E. Jones.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 171, \$3.25 paper copy, \$2.25 microfiche. Alabama Water Resources Research Institute, Auburn, Bulletin 22, January 1975. 16 p, 3 fig, 5 ref. OWRT A-021-ALA (4).

Descriptors: *Protozoa, Estuaries, *Alabama, Systematics, Surveys, Bays, Food webs, Identifiers: *Mobile Bay(Ala), *Oikomonas termo, *Mayorella oclawaha, *Prorodon opalescens.

The results of a three-year study of the protozoa of Mobile Bay, Alabama, are described for the non-scientist. Protozoa are single cell animals which are too small to be seen without a microscope, incapable of making noise, and only rarely smell bad in heavy concentrations. Protozoa are the basal animals in the animal food web; they feed on both bacteria and the unicellular green plants and thus they are the lowest point at which plant material is converted into animal material. Most of the higher animal forms would be doomed if the protozoa were absent. Mobile Bay is the the protocon were absent. Mother Bay is the third largest drainage basin in the United States. The Bay is roughly triangular in shape with the apex pointed north. Rivers bring in fresh water, nutrients and pollution and the tide brings in saline water from the Gulf of Mexico, converting the Bay into a giant mixing bowl of fresh water and marine forms. Many of each are killed by the natural rapid environmental changes, but some from each source have been able to adapt to the rapid saline changes of the Bay and have become per-manent, useful members of the Bay's animal population. Protozoa are essential to the Bay's productivity. W75-05525

INSTREAM AERATION AND PARAMETERS OF STREAM AND ESTUARINE NITRIFICA-- The State Univ., New Brunswick, N.J. Rutgers Dept. of Environmental Science.

For primary bibliographic entry see Field 5A. W75-05530

THE RATE OF MERCURY LOSS FROM CON-TAMINATED ESTUARINE SEDIMENTS IN BELLINGHAM BAY, WASHINGTON, Washington Univ., Seattle. Dept. of Oceanog-For primary bibliographic entry see Field 5B. W75-05578

MODELING OF PARTICULATES IN GARY, IN-DIANA AREA, Battelle Columbus Labs., Ohio. For primary bibliographic entry see Field 5B. W75-05586

A NUMERICAL TECHNIQUE FOR AQUIFER EVALUATION, Illinois Univ., Urbana. Dept. of Geology. For primary bibliographic entry see Field 2F. W75-05612

LOCATION OF THE NON-TIDAL CURRENT NULL ZONE IN NORTHERN SAN FRANCISCO BAY, Geological Survey, Menlo Park, Calif. D. H. Perterson, T. J. Conomos, W. W. Broenkow,

and P. C. Doherty.
Estuarine and Coastal Marine Science, Vol 3, No

Group 2L—Estuaries

Descriptors: *Estuaries, *California, *Density currents, *Tides, *Water circulation, Streamflow, Saline water intrusion, Advection.
Identifiers: *San Francisco Bay(Calif).

Variations in Sacramento-San Joaquin River charge into northern San Francisco Bay cause shifts in location of the density-current null zone. At a river flow of 2000 cu m/s this null zone is approximately 20 km from the seaward end of the estuary, whereas at a river flow of 100 cu m/s it is 80 km from the seaward end; the corresponding distances of salinity penetration are approximately 40 to 90 km from the seaward end. Seaward of the null zone, during low (Summer) river discharge conditions, the inward-flowing bottom density current appears typically strong (5-15 cm/s) relative to the outward-flowing river current (River discharge per unit cross-channel area) of greater than 2 cm/s. Landward from this null zone the average river current increases with decreasing cross-channel area. This implies that during the summer, water within the null zone has the longest average advective replacement time relative to water seaward or landward of the null zone. (Knapp-USGS) W75-05650

THE WATER QUALITY AND BOTTOM SEDI-MENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,

Rutgers - the State Univ., New Brunswick, N.J.

Dept. of Soils and Crops.
For primary bibliographic entry see Field 5B.
W75-05658

A STUDY OF BENTHIC INVERTEBRATES IN LAGOON SYSTEMS IN THE SALT MARSHES OF NEW JERSEY, Rutgers - the State Univ., New Brunswick, N.J. Dept. of Zoology.

W.S. Butterfield.

Master's Thesis, October 1973. 86 p, 15 fig, 7 tab, 4 append. OWRT B-040-NJ(3). 14-31-0001-3614.

Descriptors: *Wetlands, *Lagoons, fauna, *Bottom sediments, Benthos, *Salt marshes, Tidal marshes, Coastal marshes, *New Jersey, *Invertebrates, Environment, Dissolved oxygen, Toxicity, Decomposing organic matter.

A study was conducted in four lagoon systems located in Ocean County, New Jersey, to determine the nature of benthic fauna populations in the bottom sediments of these systems. The associated benthic environment was also studied and the benthic populations found were used as an in-dication of productivity. The four lagoon systems studied were less productive than the adjacent Barnegat Bay. On any date the predicted mean number of species found in the bay was at least twice the predicted mean for the lagoon systems Capitella capitata, one of the more tolerant estuarine species, was the most abundant organism found in the lagoons. Depth appears to be the major factor influencing the benthic environment. benthic environment in the lagoon systems can be characterized in the following manner: deeper than adjacent bay waters, weak bottom currents, fine silt-clay sediments, low dissolved oxygen concentrations and high concentrations of organic matter in the top layer of sediments. The deeper waters of the lagoon systems make bottom water exchange difficult which, in addition to low dissolved oxygen concentrations, may result in high concentrations of toxic substances, caused by the decomposition of organic matter. (Nieswand-Rutgers) W75-05664

MARINE ATLAS OF HAWAII: BAYS AND HAR-

BORS. Hawaii Univ., Honolulu. Sea Grant Program. For primary bibliographic entry see Field 7C. W75-05665 TAR POLLUTION SURVEY AT GOLDEN BEACH, FLORIDA,
Coast Guard, Goton, Conn. Research and
Development Center.

For primary bibliographic entry see Field 5B. W75-05667

A TECHNIQUE FOR PREDICTING THE MOVE-MENT OF OIL SPILLS IN NEW YORK HAR-BOR.

Coast Guard, Groton, Conn. Research and Development Center. For primary bibliographic entry see Field 5B. W75-05668

EVALUATION TEST OF A SMALL HARBOR OIL SPILL RETRIEVAL SYSTEM, Harding Pollution Control Corp., West Hemp-stead, N.Y.

For primary bibliographic entry see Field 5B. W75-05669

HYDROLOGY AND PHYTOPLANKTON OF A CONTINENTAL SHELF TRANSECT OF CAMPECHE BAY, MEXICO (AUGUST, 1972). (IN

SPANISH), Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Biologia. H. Santoyo, and M Signoret.

Rev Latinoam Microbiol. Vol 15 No 4 p 207-215. 1973 Illus. English summary.

Descriptors: *Phytoplankton, Dissolved oxygen, Water temperature, Salinity, Continental shelf, Mexico, Bays, Algae. Identifiers: Campeche Bay, Chroococcales.

Three hydrobiological areas were observed: Coastal with high phytoplankton density (20,000 to 70,000 cells/1) high salinity and temperature (37.00% and 28.8C) and low dissolved O (4.2 m1/1); Middle, with a low phytoplankton density (100 to 1,000 cells/1), low salinity (36.5%) high temperature (28.0C) and relative high dissolved oxygen (4.4 to m1/1); and Oceanic influenced area, with a low phytoplankton density (400 to 800 cells/1) except during a bloom of blue green chroococcales algae (286,800 cells/1) salinity and temperature high (37.1% and 28.5C) and the dissolved O2 in low proportion (4.2 ml/1). In vertical levels, the density of phytoplankton and variations, with the highest number of cells per liter in the deepest level (16% of light) and the lower number in the surface level (60% light).—Copyright 1974, Biological Abstracts, Inc.

DISCRIMINATION OF WASTE OILS BY MICRO EMISSION SPECTROCHEMICAL ANALYSIS,
Spectrogram Corp., North Haven, Conn.
For primary bibliographic entry see Field 5A.
W75-05680

PHYTOPLANKTON BLOOM IN THE LAGOON OF VENICE, Istituto di Biologia del Mare, Venice (Italy).

Arch Oceanogr Limnol Vol 18, No 1, p 19-37, 1973, Illus.

Descriptors: *Eutrophieation, Venice, Red Tide, *Phytoplanktion, Italy.
Identifiers: Eutreoptiella pascheri, Skeletonema costatum.

A red tide-like phenomenon (Skeletonema costatum and Eutreptiella passcheri) which took place during spring 1971 in Venice, Italy is discussed. The lagoonar origin of the organisms responsible of the phenomenon appears clear; the factors influencing the bloom have not been clearly identified, but it seems likely that tempera-

ture played an important role .-- Copyright 1974, Biological Abstracts, Inc. W75-05699

ECOLOGIC AND ADAPTIVE ASPECTS OF SOME BIVALVES OF THE SAO PAULO SEACOAST, (IN PORTUGUESE), Sao Paulo Univ. (Brazil). Dept. of Zoology.

W. Narchi.

Pap Avulsos Zool (Sao Paulo) Vol 27, No 19, p 235-262, 1974. Illus.

Descriptors: *Mollusks, Brazil. Identifiers: Anomalocardia brasiliana, Donax han-leyanus, Iphigenia brasiliensis, Tivela mactroides.

Ecological and adaptive features of 4 spp. of Brazilian bivalves are analyzed. Two species belong to the Veneracea: Anomalocardia brasiliana and Tivela mactroides and 2 to the Tellinacea: Donax hanleyanus and Iphigenia brasiliensis. As they live in different environments, they were analyzed regarding to their adaptation to the habitat, their lines of convergence and the limitations due to phylogenesis. A general comparison was made between the 4 spp. and several adaptive features were correlated to habitat. Although belonging to different families, A. brasiliana and I. brasiliensis show some convergence in anatomy orasulensis show some convergence in anatomy due to adaptation to calm waters and D. han-leyanus and T. mactroides to waters with bottom deposit disturbance.—Copyright 1974, Biological Abstracts, Inc. W75-05714

ON THE DISTRIBUTION OF EURYTERMORA AFFINIS (POPPE) (COPEPODA) IN THE WESTERN SCHELDT ESTUARY, For primary bibliographic entry see Field 5C. W75-05748

THE ECOLOGY OF THE PLANKTON OF THE CHESAPEAKE BAY ESTUARY, Johns Hopkins Univ., Baltimore, Md. For primary bibliographic entry see Field 5C. W75-05792

PRELIMINARY MODEL OF POTOMAC ESTUARY PHYTOPLANKTON, Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Program.
For primary bibliographic entry see Field 5C.
W75-05798

ESTUARIAL AND COASTAL POLLUTION, For primary bibliographic entry see Field 5B. W75-05811

MOSQUITO LAGOON BARRIER BEACH STUDY, Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
A. J. Mehta, and H. K. Brooks.
Shore and Beach, Vol 41, No 2, p 26-34, October 1973. 15 fig, 1 tab, 21 ref.

Descriptors: *Oceanography, *Marine geology, *Lagoons, *Beach erosion, *Shore protection, Breakwaters, Tides, Tidal effects, Waves(Water), Barrier Islands, Dunes, On-site investigations, Coastal engineering, *Florida, Beaches, *Barriers. Identifiers: *Mosquito Lagoon(Fla), Kennedy Space Center(Fla).

Mosquito Lagoon occurs north of False Cape as Mosquito Lagoon occurs north of False Cape as part of the cuspate foreland known as Cape Canaveral. It is part of the Kennedy Space Center property. The lagoon is separated from the Atlantic Ocean by a natural barrier beach. Major space installations are located south of the lagoon. This study was undertaken to determine if the barrier is vulnerable to an oceanic storm breakthrough, in-

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Use Of Water Of Impaired Quality—Group 3C

asmuch as the resultant tide and storm surge in the lagoon could severely affect the ecological balance of the lagoon and also damage the installations. Geological and coastal engineering evidence indicated that no major barrier breakthroughs are likely to occur, and that even in the event of such a breakthrough, the resultant tidal inlet will be subsequently closed by normal wave action and littoral transport. Calculations also indicated that the barrier will not break from the lagoonal side due to water piled up by extreme winds. It was recommended that in order for the barrier to protect the lagoon it is best to maintain the barrier beach in its present natural state. (Gibb-ISWS) W75-05829

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

FOAM AND BUBBLE FRACTIONATION FOR REMOVAL OF TRACE METAL IONS FROM California Univ., Berkeley. Dept. of Chemical En-

gineering. For primary bibliographic entry see Field 5D.

3B. Water Yield Improvement

ARTIFICIAL RECHARGE - A POTENTIAL SOLUTION FOR MANY WATER PROBLEMS, Ohio State Univ., Columbus. Dept. of Geology. For primary bibliographic entry see Field 4B. W75-05511

GEOHYDROLOGY PLEISTOCENE OF DEPOSITS AND SUSTAINED YIELD OF PRIN-CIPAL PLEISTOCENE AQUIFER, LAKE COUNTY, INDIANA, Illinois Univ., Urbana. Dept. of Geology. For primary bibliographic entry see Field 2F.

ENVIRONMENTAL CONTROLS ON GROUND-

WATER CHEMISTRY IN NEW MEXICO. I.
THE EFFECT OF PHREATOPHYTES,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience. For primary W75-05531 bibliographic entry see Field 2D.

PRESSURE BUILDUP AND DRAWDOWN BEHAVIOR IN UNDERSATURATED RESER-VOIRS OF DISCONTINUOUS PERMEABILITY, Stanford Univ., Calif. Dept. of Petroleum Engineering. For primary bibliographic entry see Field 4B. W75-05617

WATERSHED VALUES IMPORTANT IN LAND USE PLANNING ON SOUTHERN FORESTS, Forest Service (USDA), Franklin, N.C. Coweeta Hyrologic Lab. For primary bibliographic entry see Field 4D. W75-05716

WAMIS ABSTRACTS, NO. 1, Arizona Univ., Tucson. Dept. of Watershed Management. For primary bibliographic entry see Field 10A. W75-05767

3C. Use Of Water Of Impaired Quality

USES OF POWER PLANT DISCHARGE WATER IN GREENHOUSE PRODUCTION, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
K. J. Bond, W. K. Furlong, L. D. King, C. E.
Madewell, and J. B. Martin. Available from NTIS, Springfield, Va. as REPT. No. CONF. 740317-1, \$4.00 in paper copy, \$2.25 in microfiche. In: Conference on Use of Waste Water in Production of Food and Fiber, March 5, 1974, Oklahoma City, Oklahoma. Conf-740377-1, 18 p, 2 fig, 4 tab, 10 ref.

*Agriculture, *Research *Horticultural crops, * development, *Horticultural crops, *Waste disposal, *Nuclear powerplants, *Heat, *Greenhouses, Structures, Environment, Labora-*Waste *Heat, tories, Thermal pollution, Water, Coolants, Governments, Economics, Design, Evaluation, System analysis, Technology, Experimental farms, Environmental control, Environmental en-

The TVA waste heat research greenhouse at Muscle Shoals, Alabama, is the result of the cooperative efforts of many individuals. Engineers at Oak Ridge National Laboratory (ORNL) developed the basic environmental control system for the greenhouse, and provided technical assistance to TVA engineers (Division of Chemical Development) who designed the actual facility. Funds for construction of the greenhouse were provided by the Division of Power Resource Planning. The Division of Agricultural Development coordinates the project and operates the greenhouse. The three major overall objectives of the research project are to test the capabilities of the environmental control system, to determine the effect of the resulting environment on production of horticultural crops, and to evaluate the overall economics of the system. Results of engineering and horticultural tests and economic analyses will be used to refine the system. If the resulting system proves vialbe, there are tentative plans to build a facility of approximately one acre at Browns Ferry nuclear power plant in north Alabama where TVA has reserved 180 acres inside the exclusion area for possible waste heatuse. (Houser-ORNL) W75-05380

USE OF THERMALLY ENRICHED WATER FOR GROWING FIELD CROPS IN MIN-

NESOTA, Minnesota Univ., St. Paul. Dept. of Agricultural Engineering. E. R. Allred, and J. R. Gilley.

E. N. Aureu, and J. N. Gilley. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 112, \$3.25 in paper copy, \$2.25 in microfiche. 1974. 6 p, 13 fig, 1 tab. OWRT B-057-MINN(4), 14-31-0001-3602.

Descriptors: *Irrigation, Soils, Energy, Crops, *Minnesota, *Crop production, *Potatoes, Benefi-

Identifiers: *Waste heat utilization, *Soil warming, *Elk River(Minn).

The purpose was to evaluate the use of waste heat energy for the growing of agricultural crops near Elk River, Minnesota; to determine the base heat transmissibility characteristics of soil; and to evaluate crop frost protection benefits as the result of uate crop frost protection benefits as the result of the soil warming process. Conclusions were: Soil warming is necessary for extension of the growing season for field crops in Minnesota. Soil warming cannot be done effectively by using an irrigation system alone. Artificial warming of a field soil by utilization of waste heat energy does not provide significant protection for potatoes against frosts at temperatures below 28F. Maturity date for early

potatoes varieties grown in heated soil can be advanced between two and three weeks, as compared to potatoes grown in unheated field soils. Only small quantities of waste heat energy can be utilized by a field soil in Minnesota during July and August. (Walton-Minnesota) W75-05440

CROP RESPONSE TO WARMING SOILS ABOVE THEIR NATURAL TEMPERATURES, Oregon State Univ., Corvallis. Dept. of Soils. K. A. Rykbost, L. Boersma, H. J. Mack, and W. E.

Available from the National Technical Informa tion Service, Springfield, Va. 22161 as PB-240 028. Paper copy \$5.25, microfiche \$2.25. Agricultural Experiment Station, Special Report 385, January 1974. 98 p, 11 fig, 43 tab, 46 ref. OWRT B-028 ORE(3).

Descriptors: Soils, *Crop production, Agriculture, Economic feasibility, *Oregon, Heated water, *Crops response, *Soil temperature, Irrigation. Identifiers: *Willamette Valley(Ore), *Soil warming, *Waste heat utilization.

The subsurface application of heat to soil by circulating the warm water through a network of buried pipes was studied. The effect of increased soil temperatures on crop production was evaluated. In areas where crop irrigation is required, subsurface irrigation with warm water could be practiced or water taken from the soil heating loop could be applied with sprinklers. Experimental procedures, the crop yield response to soil warming, and the economic feasibility of production using these methods are described. W75-05451

SOIL AND AIR TEMPERATURE CHANGES IN-DUCED BY SUBSURFACE LINE HEAT SOURCES,
Oregon State Univ., Corvallis. Dept. of Soils.

K. A. Rykbost, and L. Boersma.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 280, \$5.25 paper copy, \$2.25 microfiche. Agricultural Experiment Station, Special Report 402, December 1973. 105 p, 22 fig, 38 tab, 17 ref. OWRT B-028-ORE(2).

Descriptors: *Heated water, *Soil temperature, *Air temperature, Soil water, Energy budget,

Identifiers: *Soil warming, *Waste heat utiliza-

Multiple use of waste heat from power plants may become an important consideration in their development and siting. The heat in the cooling water must be considered a resource to be managed for effective use. Soil warming was suggested as one of several possible productive uses for the heated discharges. The sub-surface application of heat to soil by circulating the warm water through a network of buried pipes was proposed and studied. In regions where soil temperatures limit plant growth, artificial soil warming may be an economically feasible practice. This hypothesis was evaluated in the soil warming experiment. Energy balances and water regimes of soils heated above natural temperatures are described. W75-05452

OPTIMAL ALLOCATION OF WATER QUALI-TY CONTROLS IN URBANIZING RIVER

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G. W75-05774

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C—Use Of Water Of Impaired Quality

SOIL AND GROUND-WATER SALINIZATION BENEATH DIVERSIFIED IRRIGATED AGRICULTURE,

Agricultural Research Service, Fresno, Calif. Ground Water Recharge Field Station. H. I. Nightingale.

No. 1. Nightingare.
Soil Science, Vo 188, No 6, p 365-373, December 1974, 5 fig. 1 tab, 24 ref.

Descriptors: *Saline soils, *Alkaline soils, *Soil management, *Irrigated land, *Irrigation effects, Sampling, Water sampling, Salinity, Groundwater, *California, Fruit crops, Irrigation practices, Agriculture, Agronomy, Speciality crops, Environmental effects, Soil-water-plant relationships, Orchards, Oranges, Soil analysis, Statistical methods, Variability.

methods, Variability.
Identifiers: Grapes, Row crops, Truck crops,
Fresno County(Calif).

Evaluation of salinization of groundwater in a 334 sq mi area of diverse irrigation agriculture was un-dertaken in Fresno County, California. Cumulative percentage frequency curves for soil salinity concentrations (Based on 556 samples) were presented for the 1.83 to 6.10 m soil depth interval under four crop classifications. The geometric mean soil salinity at this depth interval under no crops, grapes, row and truck crops, and orchards was 49, 52, 63 and 97 mg total soluble salts per kg dry soil (TSS/kg), respectively. When the soil dry soil (TSS/kg), respectively. When the soil salinity exceeded 190 mg TSS/kg, orchards contributed 73.3% of the observations. When soil salinity was less than 40 mg TSS/kg, grapes contributed 52.8% and row and truck crops 28.3%. A cumulative percentage frequency curve for groundwater salinity concentrations was defined from 244 observations from 80 wells sampled in 1969, 1970, and 1972. There was good agreement with the projected curve which was based on the 556 soil salinity values. The observed groundwater geometric mean, EC, was 420 micromhos/cm as compared to 390 micromhos/cm on the projected curve. It was shown that groundwater salinity can be related to soil salinity and irrigated crop management on a field scale. (Sanderson-ISWS)

3D. Conservation In Domestic and Municipal Use

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING, BENEFITS OF PROTECT-ING URBAN FLOODPLAINS, Washington Univ., St. Louis, Mo. Inst. for Urban

and Regional Studies.

For primary bibliographic entry see Field 4A.

W75-05481

AN EVALUATION OF WATER REUSE FOR MUNICIPAL SUPPLY, Southern Illinois Univ., Carbondale.

For primary bibliographic entry see Field 5D. W75-05482

GEOLOGY AND GROUND WATER RESOURCES OF SUSSEX COUNTY AND THE WARREN COUNTY PORTION OF THE TOCKS ISLAND IMPACT AREA,

ISLAND IMPACT AREA, New Jersey Dept. of Environmental Protection, Trenton. Div. of Water Resources. For primary bibliographic entry see Field 4B. W75-05513

ESTIMATION OF COMMERCIAL, INDUSTRI-AL AND GOVERNMENTAL WATER USE FOR LOCAL AREAS, California Univ., Santa Barbara.

California Univ., Santa Barbara. For primary bibliographic entry see Field 6D. W75-05604 PUBLIC PERCEPTIONS OF WATER QUALITY IN A METROPOLITAN AREA, Georgia Inst. of Tech., Atlanta. School of Industri-

al and Systems Engineering.
For primary bibliographic entry see Field 5G.
W75-05605

A CLIMATIC MODEL OF URBAN ENERGY BUDGETS, California Univ., Los Angeles. Dept. of Geog-

raphy.
For primary bibliographic entry see Field 4C.
W75-05683

WATER SUPPLY, TREATMENT, DISTRIBU-TION, AND REUSE OPTIMIZATION IN ARID URBAN AREAS, Colorado State Univ., Fort Collins. Dept. of

Colorado State Univ., Fort Coluns. Dept. o Agricultural Engineering. For primary bibliographic entry see Field 6A. W75-05773

OPTIMAL ALLOCATION OF WATER QUALI-TY CONTROLS IN URBANIZING RIVER BASINS, Colorado State Univ., Fort Collins. Dept. of

Agricultural Engineering.
For primary bibliographic entry see Field 5G.

3E. Conservation In Industry

DIGEST OF ENERGY FACTS FOR WATER RESOURCES STUDIES IN MINNESOTA, Minnesota Univ., Minneapolis. Water Resources

Research Center.

W. C. Walton.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 961, \$4.75 in paper copy, \$2.25 in microfiche. Bulletin 74, September 1974. 76 p, 46 tab. OWRR A-999-MINN(33)

Descriptors: *Energy, Water policy, *Minnesota, Water utilization, Resources, Conservation, Environment, Production.
Identifiers: *Energy-water relationships.

A digest is presented of available information concerning energy-water relationships, energy resources, consumption, sources, production, conservation, and environmental (including water resources) concerns which can serve as a background document for those who are interested in water resources and energy in Minnesota. W75-03352

USES OF POWER PLANT DISCHARGE WATER IN GREENHOUSE PRODUCTION, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development. For primary bibliographic entry see Field 3C. W75-05380

CONTROL OF MERCURY IN EFFLUENTS FROM CHLORINE PLANTS, Swedish Water and Air Pollution Research Lab., Stockholm. For primary bibliographic entry see Field 5D. W75-05435

THE IMPACT OF ENERGY DEVELOPMENT ON WATER RESOURCES IN ARID LANDS, LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY.

BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
C. Bowden.

Available from the National Technical Information Service as PB-240 008, \$8.75 in paper copy, and \$2.25 in microfiche. Arid Lands Resource Information Paper No 6. January 1975. 278 p, 17 fig, 492 refs.

Descriptors: *Bibliographies, *Arid lands, *Water demand, *Water shortage, *Energy, Strip mines, Strip mine wastes, Oil shales, Coals, Great Plains, Colorado River Basin, Missouri River, Rocky Mountain region, Southwest U.S., Environmental effects, Social aspects, Water allocation(Policy), Water quality, Energy conversion, Geothermal studies, Nuclear energy, Nuclear waste.

Water is basic to energy conversion systems, natural and man-made. Consequences of energy extraction and conversion in arid lands where water is scarce. The historical past is utilized as a record for casting modern development plans into perspective; the worldwide growth in energy consumption rates is considered as the motive force behind many current energy projects in arid lands. Energy sources (Coal, oil, gas, oil shale, solar energy, alternative energy, alternative energy, sources, fission, fusion, and geothermal) are reviewed in terms of their consequences on the air, land, water, and inhabitants of such regions. Two rivers, the Colorado and the Missouri, provide small-scale models of the rewards and hazards of heavily exploiting water-short areas. In both instances, energy development plans, as now proposed, will seriously deplete the water supply, alter the quality of the water, land, and air, and increase the human population. A great deal of energy can be extracted from arid lands but the consequences of such extraction on the environment are but sketchily known because development plans have received more attention than environmental impact.

CHARACTERIZATION OF FRUIT AND VEGETABLE PROCESSING WASTEWATERS, Oregon State Univ., Corvallis. Dept. of Food Science and Technology. For primary bibliographic entry see Field 5B. W75-0558.

EXAMPLES OF WATER AND AIR PURIFICA-TION BY CATALYTIC REACTIONS (BEISPIELE FUER DIE REINHALTUNG VON WASSER UND LUFT DURCH KATALYTISCHE REAKTIONEN),

REAKTIONEN),
For primary bibliographic entry see Field 5D.
W75-05540

MODELING CADMIUM DISCHARGE FROM AN ELECTROPLATING LINE WITH THE GASP IV SIMULATION LANGUAGE, Purdue Univ., Lafayette, Ind. School of Industrial Engineering. For primary bibliographic entry see Field 5B. W75-05573

ESTIMATION OF COMMERCIAL, INDUSTRI-AL AND GOVERNMENTAL WATER USE FOR LOCAL AREAS, California Univ., Santa Barbara. For primary bibliographic entry see Field 6D. W75-05604

SIMULATED EFFECTS OF OIL-SHALE DEVELOPMENT ON THE HYDROLOGY PICEANCE BASIN, COLORADO, Geological Survey, Reston, Va. For primary bibliographic entry see Field 4C. W75-05637

INDUSTRIAL WATER PRETREATMENT, Calgon Corp., Pittsburgh, Pa. Water Management Div. For primary bibliographic entry see Field 5D.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

stress.

Conservation In Agriculture—Group 3F

W75-05695

MERCURY, CADMIUM, AND CHROMIUM IN THE NETHERLANDS, (LE MERCURE, LE CADMIUM ET LE CHROME AUX PAYS-BAS), Central Lab. TNO, Delft (Netherlands). For primary bibliographic entry see Field 5B. W75.67310. W75-05710

3F. Conservation In Agriculture

A COMPUTERIZED MODEL FOR DETERMINING THE OPTIMAL WATER UTILIZATION FOR AGRICULTURE,

North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 6A. W75-0336

PROTECTION OF THE ENVIRONMENT FROM CONTAMINATION WITH PESTICIDES USED IN COTTON GROWING, (IN RUSSIAN), For primary bibliographic entry see Field 5G. W75-05408

DAVIS COUNTY COMPREHENSIVE STUDY: CULINARY WATER, PRESSURE IRRIGATION WATER, SANITARY SEWERAGE.

Davis County Planning Commission, Farmington, Utah. 1970. 64 p, 1 fig.

Descriptors: *Sewerage, *Water supply develop-ment, *Utah, *Irrigation water, Planning, Ur-banization, Public utilities, Scheduling, Water resources development, Irrigation engineering, Comprehensive planning.

Identifiers: *Davis County(Utah), Culinary water, Pressure irrigation, Sanitary sewerage.

A plan was prepared for Davis County, Utah, lying northwest of Salt Lake City. The objective was to (a) correlate the functions of the existing and proposed facilities of these three utility systems within the communities and county; (b) make a layout, preliminary design and cost esti-mate of additional facilities which would most economically serve the needs of Davis County for the next 20 years; and (c) prepare a schedule for these facilities to be constructed during each five years for the 20-year period. A separate report was prepared for each of the three utility systems, with maps showing the existing and proposed facilities and tables giving the cost estimates and construc-tion schedules. Inventories and projections of the 19 water systems of the County are presented. The same type of information is given for three conservancy districts pertaining to pressure irrigation. Sanitary sewerage plans are described for three sewer systems in the County. Countrywide maps for culinary water and pressure irrigation are in-cluded. (Poertner) W75-05418

USE OF WASTE HEAT FOR SOIL WARMING AND IRRIGATION IN NORTHERN CLIMATES, Minnesota Univ., St. Paul. Dept. of Agricultural

Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
E. R. Allred, P. E. Read, and J. R. Gilley.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 181, \$3.25 in paper copy, \$2.25 in microfiche. Presented at 1973 Winter Meeting American Society of Agricultural Engineers. Chicago, Illinois December 11-14, 1973. Paper No 73-2544. 8 p, 11 fig. 1 tab. OWRT B-057-MINN(2), 14-31-0001-3602.

Descriptors: *Irrigation, Soils, Energy, Crops, *Minnesota, *Potatoes, Loam, *Crop production, Cold regions.
Identifiers: *Waste heat utilization, *Soil warm-

ing, Elk River(Minn).

Maturity rates, yield and frost protection benefits were measured for potatoes being grown in a Hubbard sandy loam soil near Elk River, Minnesota. Field plot soil was heated by circulation of water (100F) through underground piping system. Growing season was advanced sufficiently in spring to permit harvest of second potato crop. (Walton-Minnesota)
W75-05444

PHYSIOLOGICAL EFFECTS OF WATER STRESS ON YOUNG CORN PLANTS, Oregon State Univ., Corvallis. Dept. of Soils. For primary bibliographic entry see Field 21. W75-05450

AQUATIC PLANTS FROM MINNESOTA, PART 5 - DIGESTIBILITY AND FERMENTATION OF AQUATIC PLANTS, Minnesota Univ., Minneapolis. Dept. of Animal

Science.

J. G. Linn, R. D. Goodrich, and E. J. Staba Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 206, tion Service, springified, va 22161 as FB-240 23, 3.75 in paper copy; \$2.25 in microfiche. Water Resources Research Center, Minneapolis, University of Minnesota, Bulletin 70, Aug 1974. 24 p, 9 tab, 35 ref. OWRT A-025-MINN(10).

Descriptors: *Aquatic plants, Forage, *Silage, *Minnesota, *Fermentation, *Digestion, *Forage palatability, Sheep, Alfalfa. Identifiers: Ensiling.

The research was conducted to characterize the fermentation of aquatic plants ensiled with and without additives and to determine the digestibility of dried and ensiled aquatic plants by lambs.

Aquatic plants ensiled with the addition of organic acids, corn or haylage produced silages of undesirable quality. Additions of haylage to sterilized aquatic plants before ensiling resulted in a silage of more desirable quality. Dry matter and crude protein digestibilities for sheep fed diets that contained either Myriophyllum exalbescens or Potamogeton pectinatus were lower than for lambs fed dehydrated alfalfa. However, energy digestibility was highest for lambs fed Myriophyllum exalbescens. Myriophyllum exalbescens appeared to be more palatable than Potamogeton pectinatus, but both were inferior to dehydrated alfalfa. Dry matter intakes of lambs fed ensiled aquatic plants, aquatic plants plus corn or aquatic plants plus haylage were lower than lambs fed either haylage or haylage plus corn diets. Additions of corn and haylage significantly increased aquatic plant or-ganic matter digestibility. Energy and nitrogen digestibilities were lower for lambs fed diets that contained aquatic plants than for lambs fed haylage diets. The palatability of aquatic plants is a limiting factor in their use as a forage. Drying or ensiling do not appear to improve palatability. (See also W73-13716) (Walton-Minnesota) W75-05466

MULTIPLICATION OF ALGAE IN SEWAGE WATER.

Tamil Nadu Agricultural Univ., Coimbatore, (India) For primary bibliographic entry see Field 5G.

W75-05539

EFFECTS OF AMMONIUM NUTRITION ON WATER STRESS, WATER UPTAKE, AND ROOT PRESSURE IN LYCOPERSICON ESCU-LENTUM MILL, Du Pont de Nemours (E. I.) and Co., Wilmington,

Del. Central Research Dept.

B. Quebedeaux, Jr., and J. L. Ozbun.

Plant Physiol Vol 52, No 6, p 677-679, 1973. Illus. Identifiers: *Ammonium, Lycopersicon-esculentum, Nitrates, Nutrition, Root pressure, Water stress, *Tomatos, Root exudation, Absorption.

Ammonium (NH4+) nutrition inhibits w-ter uptake and root exudation of decreases leaf water potential of tomato plants grown in solution cul-ture. This inhibition is readily reversible by NO3-for short term exposures to NH4+; however, recovery is delayed following long term expo-sures.—Copyright 1974, Biological Abstracts, Inc. W75-05548

INFLUENCE OF MOISTURE, HEAT AND LIGHT STRESS ON HYDROGEN FLUORIDE FUMIGATION INJURY TO SOYBEANS, Utah State Univ., Logan. Dept. of Botany. H. H. Wiebe, and B. W. Poovaiah. Plant Physiol, Vol 52, No 6, p 542-545, 1973. Identifiers: Air, "Fumigation, Glycine-max, Heat, "Hydrogen fluoride, Light, Pollution, "Soybeans,

*Stomatal closure, Absorption, Soil moisture

Soybean (Glycine max (L) Merr) plants were exposed to a single fumigation with hydrogen fluoride (HF) at concentrations sufficient to cause visible injury within 2 days. They were subjected to soil moisture or osmotic stress prior to, during or after fumigation. Moisture stress before or during fumigation reduced injury because of stomatal ing tunigation reduced injury because of stomatal closure and reduced F uptake. Moisture stress after fumigation markedly accentuated the injury resulting from a single fumigation compared to plants kept continually under optimum soil moisture conditions. Full sunlight following the fumigation accentuated injury, while shade reduced it. Higher temperatures following fumigation also increased severity of symptoms.—Copyright 1974, Biological Abstracts, Inc. W75-05588

YIELD OF GREEN PEAS: II. EFFECTS OF

WATER AND PLANT DENSITY,
Agricultural Research Council, Trumpington
(England). Plant Breeding Inst.
J. A. D. Anderson, and J. G. H. White.
N Z J Exp Agric, Vol 2, No 2, p 165-171, 1974,

Identifiers: *Green peas, *Irrigation, Pisum-sativum, Rainfall, Soils, *Crop yield, *Soil

Green peas (Pisum sativum L. cv. 'Victory Freezer') were grown at 5 plant densities (52, 90, 105, 182, 358 plants/sq m) and 3 soil moisture treatments: natural rainfall, irrigation at flowering and pod swelling, and water stress at these periods. Both total green yield and green pea yield increased with increasing density, although green pea yield dropped slightly below 182 plants/sq m. No significant differences occurred between natural rainfall and water stress treatments. Irrigation gave an 87% increase in total green weight and a 56% increase in green pea yield. There was no indi-cation of maximum yield occurring at a higher population under irrigation than under dryland conditions. Dryland peas matured 5-7 days earlier than those irrigated, the highest density being 2-4 days earlier than the lowest. Total vine length, full pods/plant, ovule initials/pod, peas/pod, and percentage of peas and pods at higher nodes all in-creased with decreasing plant density and irriga-tion. Vine length to the 1st pod and percentage of peas > 11.1 mm sieve size increased with irriga-tion. The percentage of peas < 7-9 mm increased with decreasing plant density, and the reverse oc-curred with the percentage of pale peas. Highest mature seed yields were obtained at 105 plants/sq m. The response to irrigation was similar to that for green peas. Practical implications of these results are discussed.--Copyright 1974, Biological Abstracts, Inc. W75-05758

INVENTORY THEORY APPLICATION TO THE OPTIMUM CONTROL OF IRRIGATION

WATER, Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

For primary bibliographic entry see Field 6A. W75-05771

CHARACTERISTICS OF THE WINTER HYDROMETEOROLOGICAL REGIME OF DRAINED MINERAL SOILS, For primary bibliographic entry see Field 2G. W75-05833

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

COMMERCIAL NAVIGATION ON THE UPPER MISSISSIPPI RIVER: AN ECONOMIC REVIEW OF ITS DEVELOPMENT AND PUBLIC POLICY ISSUES AFFECTING MINNESOTA,

Minnesota Univ., Minneapolis. Dept. of Agriculture and Applied Economics.

R. W. Christianson.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 962, \$5.25 in paper copy, \$2.25 in microfiche. University of Minnesota Water Resources Research Center, \$t. Paul, Bulletin No. 75, October 1974. 115 p. 15 tab, 10 fig. OWRT B-054-MINN(6). 14-31-0001-3601.

Descriptors: *Navigation, development, *Minnesota, *Water policy, *Transportation, *Inland waterways, Economics, Reviews, *Mississippi River, *Water demand, Model studies, Dredging, Waste disposal, Pollution taxes(Charges), Costs.
Identifiers: Public policy.

Inland waterway transport is a significant carrier of domestic cargo, accounting for about 14% of the total traffic. During the past decade cargo carried by the inland waterways increased by 46% (62% when the Great Lakes are excluded). By increasing the absolute amount of freight carried greater than the average (42%), the inland waterway's relative share of total freight traffic has also grown over the past decade. Also, development of the Upper Mississippi River into a major inland waterway has been even more significant for Min-nesota and the Midwest than for much of the rest of the nation. A transportation model, based on competitive assumptions and employing a derived demand analysis, is presented. The model predicts that there will be an increase in demand for transportation services, especially barge services. However, derivation of the elasticity of demand for barge services revealed that the demand for barge services will become more elastic in the future. The current issues in commercial navigation which affect Minne, ota involve a resolution of the conflict between developmental and environmental values. The dredging issue reduces to one of what cost is the public willing to bear to preserve environmental values being destroyed by present methods of dredging and placement of dredge spoil. However, instead of the general public bear-ing the cost, users of the 9-foot navigation channel ing the cost, users of the 9-foot navigation channel could be required to pay the full costs of environmentally sound dredge spoil disposal. With a system of user charges in effect, environmental values would be better accounted for and barge transportation would be assigned to its most efficient position in the national transportation system. (Waelti-Minnesota) W75-05353

DRAINAGE PLANS WITH ENVIRONMENTAL BENEFITS.

Poertner (Herbert G.), Bolingbrook, Ill. For primary bibliographic entry see Field 8A. W75-05422 HYDROLOGICAL BALANCING ACT ON A TEXAS NEW TOWN SITE.
American Society of Landscape Architects Louisville, Ky.
For primary bibliographic entry see Field 8A.

PONDING AGAINST THE STORM, Obrist, (Alfred), Syracuse, N. Y. For primary bibliographic entry see Field 8A. W75-05425

W75-05424

SMOOTHER WATERS FOR THE NEXT 110,000, Northampton Development Corp. (England). For primary bibliographic entry see Field 8A. W75-05427

LAND-USE CHANGES AND THE ECONOMIC EVALUATION OF NATURAL VIRGINIA PINE STANDS ON THE DIAL CREEK WATERSHED, DURHAM COUNTY, NORTH CAROLINA, North Carolina State Univ., Raleigh. School of Forest Resources.

For primary bibliographic entry see Field 4D. W75-05446

INVESTIGATION OF ARTIFICIAL LAKE DESTRATIFICATION - A HYDRAULIC MODEL STUDY,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W75-05449

SELECTIVE WITHDRAWAL AT AN INTER-MEDIATE DEPTH FROM A DENSITY STRATIFIED IMPOUNDMENT, Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5G. W75-05456

EVALUATION OF FLOOD PEAK PREDICTION METHODS IN NORTHERN NEVADA IN RELATION TO DAM SAFETY, Nevada Univ., Reno. Desert Research Inst.

Nevada Univ., Reno. Desert Research Inst. For primary bibliographic entry see Field 8B. W75-05468

MUNICIPAL AND INDUSTRIAL REIMBURSE-MENT FOR A WATER RESOURCE PROJECT IN WYOMING'S PLATTE RIVER BASIN, Wyoming Univ., Laramie. Div. of Agricultural Economics. For primary bibliographic entry see Field 6C. W75-05472

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING, BENEFITS OF PROTECT-ING URBAN FLOODPLAINS, Washington Univ., St. Louis, Mo. Inst. for Urban

and Regional Studies.

and Regional studies. IWR Contract eport 74-14, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., November 1974. 103 p, 5 fig, 8 tab, 23 ref, 3 append.

Descriptors: *Flood protection, *Flood plains, *Methodology, *Land use, *Pestimating, *Benefits, Management, Economics, Planning, Constraints, Measurement, Linear programming, Regression analysis, Simulation analysis, Mathematical models, Systems analysis.

Identifiers: *Urban flood plains, *Land values, Urban studies, Open space, Benefit maximization, Impact assessment, Flood risk.

Subject to problems caused by externalities, the benefits of floodplain protection can be appropriately measured by direct estimation or by examining changes in site values, with and without protection, on the affected areas. Usually, benefit calculations must be made in some kind of general equilibrium framework, though a relatively simple theoretical scheme will suffice in most circumstances. Such a theoretical model is presented which includes provision for 'amenity' as well as for 'locational' advantages of flood control, considers floodproofing as well as containment structures as a damage reduction technique, and considers restriction of flood plain occupancy as an alternative to control flood waters. Described is the theory underlying two major completed methodologies using the above-mentioned measurments. Weisz uses a linear programming model to maximize the benefits as measured by land values. INTASA, however, avoids the maximization approach, preferring to work within the frame of very detailed planner projections and rankings. INTASA uses changes in land values in estimating the value of amenities and social environment effects. The theory underlying these two methodologies is found to be substantially the same and generally sound. A regression model of the effect of flood risk on land values developed with St. Louis data is found to be much more empirically W75-05481

LIME RETENTION IN ANTHRACITE COAL-BREAKER REFUSE,

Forest Service (USDA), Kingston, Pa. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4D. W75-05496

SIMULATION OF STORM VELOCITY EF-FECTS ON FLOW FROM DISTRIBUTED CHANNEL NETWORKS, Nebraska Univ., Lincoln. Dept. of Computer

Nebraska Univ., Lincoln. Dept. of Compute Science. For primary bibliographic entry see Field 2E. W75-05518

DRAINAGE BASIN RESPONSE: DOCUMENTED HISTORICAL CHANGE AND THEORETICAL CONSIDERATIONS. STUDIES IN FLUVIAL GEOMORPHOLOGY. NO. 3, Purdue Univ., Lafayette, Ind. Dept. of Geosciences. For primary bibliographic entry see Field 2E. W75-05527

GENETIC VARIABILITY IN SURVIVAL AND GROWTH OF VIRGINIA PINE PLANTED ON ACID SURFACE-MINE SPOIL, Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4D. W75-05594

PERFORMANCE OF RED PINE AND JAPANESE LARCH PLANTED ON ANTHRACITE COAL-BREAKER REFUSE, Forest Service (USDA), Kingston, Pa. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4D. W75-05597

VEGETATING STRIP-MINE SPOILS FOR RU-NOFF AND EROSION CONTROL, Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4D. W75-05603

STREAM GAGING BY CONTINUOUS INJEC-TION OF TRACER ELEMENTS, Arizona Univ., Tuscon. Graduate Committe on Hydrology. For primary bibliographic entry see Field 2E.

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Control Of Water On The Surface—Group 4A

W75-05619

COMBINING ESTIMATES OF LOW-FLOW CHARACTERISTICS OF STREAMS IN MAS-SACHUSETTS AND RHODE ISLAND. Geological Survey, Boston, Mass. For primary bibliographic entry see Field 2E. W75-05629

ADJUSTMENT OF LOGARITHMIC FLOOD-FREQUENCY STATISTICS FOR GAGED CALIFORNIA STREAMS TO MINIMIZE THE TIME SAMPLING ERROR, Geological Survey, Menlo Park, Calif. S. E. Rantz, and J. R. Crippen. Available from the Superintendent of Documents, GPO Washington, DC 20402, \$3.15. Journal of Research of the US Geological Survey, Vol 3, No

1, p 113-121, January-February 1975. 1 fig, 4 tab, 7 ref. Descriptors: *Flood frequency, *Statistics, *California, Statistical methods, Snowmelt, Rainfall-runoff relationships, Peak discharge.

Identifiers: *Pearson type III distribution

Methods for adjusting logarithmic flood-frequency statistics for gaged streams to minimize the time sampling error that is inherent in short records are discussed. Statistical procedures for adjusting the mean and standard deviation of a short-term array of annual peak discharges are already well established; two standard sets of equa-tions for utilizing the additional information contained in longer records of peak discharge observed at nearby gaging stations are given. A stan-dard method for adjusting the coefficient of skew does not exist, and consequently a special technique for estimating the long-term value of that statistic was developed for this study. Re-gional equations were developed that relate the logarithmic skew coefficient to logarithmic trans-formations of mean annual basinwide precipitation Tormations of mean annual passions of precipitation and mean annual peak discharge per square mile. The technique appears to be satisfactory for use in the greater part of California, where over large areas the peak discharge in any year is usually associated with a single widespread general storm-or with a series of such storms where snowmelt ruprecipitation events. (Knapp-USGS)

SUMMARY OF MULTISPECTRAL FLOOD IN-UNDATION MAPPING IN IOWA, Iowa State Geological Survey, Iowa City. For primary bibliographic entry see Field 7C. W75-05639

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.

Open file report 74257, 1974. 2 fig, 4 tab, 19 ref.

Descriptors: *Surface-groundwater relationships, *Canals, *Florida, *Flood control, *Diversion, Water levels, Aquifers, Hydrologic aspects, Hydrogeology. Identifiers: *Tampa Bypass Canal(Fla).

Floodwater of the Hillsborough River will be diverted at a point upstream from areas of floodplain encroachment in the cities of Tampa and Temple Terrace into nearby McKay Bay by means of the Tampa Bypass Canal System, which is being built through an area east of Tampa. The canal system will breach the underlying artesian Floridan aquifer in places where the potentiometric surface of the aquifer is at or near land surface, causing drawdowns over a wide area and diverting flow from other parts of the hydrologic system. A water-control structure would maintain the pool level in the Eureka Springs and Harney Flats areas at a 5-foot higher level than without the structure, reducing drawdown in and discharge from the

Floridan aquifer in these areas. The canal system, as presently designed, will lower the potentiometric surface of the Floridan aquifer by 1 foot or more over an area of about 92 square miles with C-132 (Thonontosassa Canal) included in the system and about 48 square miles without C-132; discharge from the aquifer into the canal system will be 22 million gallons per day with C-132 and 15 million gallons per day without C-132. If another structure is added to the canal system, the area of drawndown (1 foot or more) of the poten-tiometric surface will be less by 45% and the discharge less by 40% with C-132 included in the system; without C-132 the area of drawdown will be less by 50% and the discharge less by 45%. (Knapp-USGS) W75-05640

DERIVATION OF HOMOGENEOUS STREAM-FLOW RECORDS IN THE UPPER KENTUCKY RIVER BASIN, SOUTHEASTERN KENTUCKY, Geological Survey, Louisville, Ky. For primary bibliographic entry see Field 2E. W75-05644

A MANUAL FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS ON UNGAGED STREAMS IN INDIANA,

Geological Survey, Indianapolis, Ind

Indiana Department of Natural Resources, Division of Water Technical Memorandum 75-1, 1975.

Descriptors: *Peak discharge, *Floods, *Indiana, Flood recurrence interval, Small watersheds, Discharge(Water), Rainfall-runoff relationships, Flood frequency.

Peak discharges for the 10-, 25-, 50-, and 100-year recurrence intervals may be estimated from rela-tions given for ungaged sites on naturally flowing streams in Indiana. The discharges estimated from the equations and graphs do not include any safety factors or 'freeboard' requirements that may be a part of design criteria. Estimating relations were defined from data on the flow magnitudes and on the characteristics of the contributing drainage basins of gaged streams. The sample of gaging sites includes rural streams draining an area larger than 15 square miles and containing no significant flow-regulating structures; the estimating relations should be used only for similar ungaged stream sites. For gaged streams, probability analyses of the flood record provide a more reliable estimate of future flood occurrence than the estimating relations. (Knapp-USGS) W75-05645

MARION-MOULTRIE SYSTEM INVESTIGATION: PART I-MODEL SELECTION, CALIBRATION, AND ERROR

ANALYSIS, Geological Survey, Columbia, S.C. For primary bibliographic entry see Field 2E. W75-05646

FLOOD OF AUGUST 2, 1972, IN THE LITTEL MAQUOKETA RIVER BASIN, DUBUQUE COUNTY, IOWA,

Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 2E. W75-05648

FLOOD-FLOW CHARACTERISTICS OF THE CHENANGO RIVER AT PROPOSED INTERSTATE HIGHWAY IN TOWNS OF FENTON AND CHENANGO, BROOME COUNTY, NEW YORK, Geological Survey, Albany, N.Y.

B. Dun

Open-file report, June 1972. 11 p, 5 fig, 1 tab, 3 ref.

Descriptors: *Floods, *Design flood, *New York, Stage-discharge relations, Highways, Bridges. Identifiers: *Chenango River(NY).

The New York State Department of Transportation is planning a proposed interstate highway alongside the Chenango River in the towns of Fenton and Chenango, Broome County, New York. An analysis of flood-flow characteristics of the channel for four proposed highway routes was made to determine the effect of each plan. Information is provided on magnitude and frequency of floods and an analysis is presented of the effects of the proposed routes on hydraulic characteristics of the stream reach. The 100-year flood discharge used was 57,000 cfs. The normal water-surface elevation was determined to be 851.80 feet at the downstream end of the reach and 858.36 feet at the Erie-Lackawanna Railroad bridge. The proposed highway routes would result in stage increases of from 1.2 feet to 2.3 feet at the E-L railroad bridge for the design discharge of 57,000 cfs. The max-imum mean velocity would be 10.9 feet per second. (Knapp-USGS) W75-05655

STOCHASTIC MODELING OF THE PASSAIC RIVER FLOW.

Rutgers - the State Univ., New Brunswick, N.J. Rutgers - the State Univ., New Brunswick, N.J. Dept. of Chemical Engineering; and Rutgers - the State Univ., New Brunswick, N.J. Dept. of Biochemical Engineering. For primary bibliographic entry see Field 2E. W75-05660

REVERSE FLOW ROUTING BY THE IMPLICIT

METHOD, State Univ. of Iowa, Iowa City. Dept. of Mechanics and Hydraulics. For primary bibliographic entry see Field 2E. W75-05675

BEDROCK INTENSITY ATTENUATION AND SITE FACTORS FROM SAN FERNANDO EARTHQUAKE RECORDS,

California Univ., Los Mechanics and Structures. Angeles. Dept. of For primary bibliographic entry see Field 8E. W75-05684

WATERSHED VALUES IMPORTANT IN LAND USE PLANNING ON SOUTHERN FORESTS, Forest Service (USDA), Franklin, N.C. Coweeta Hyrologic Lab. For primary bibliographic entry see Field 4D. W75-05716

USE OF REMOTE SENSING FOR VEGETA-TION INVENTORIES IN A DESERT SHRUB COMMUNITY,

Arizona Univ., Tucson. Dept. of Watershed For primary bibliographic entry see Field 7B. W75-05721

A TIME-SPACE TECHNIQUE TO ANALYZE SNOWPACKS IN AND ADJACENT TO OPENINGS IN THE FOREST.

Arizona Univ., Tucson, Dept. of Watershed

Arizona Univ., Tucson, Dept. of Watersneu Management. S. R. Gopen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 276, \$4.75 in paper copy; \$2.25 in microfiche. Master's Thesis, 1974. 77 p. 3 fig. 5 tab, 40 ref, 6 append. OWRR A-037-ARIZ(2). 14-31-0001-3803.

Snowmelt, Descriptors: Runoff, *Snowpacks, Time series analysis, *Land manage-ment, *Arizona, *Forest management, Water supply, *Regression analysis, Water yield, Lum-Identifiers: *Forest openings.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

A general technique was developed to enable the land manager to predict the 'net' effect of an opening on the snowpack in and adjacent to that opening at any given location at any point in time. The technique was illustrated by collecting data at seven study sites located in the ponderosa pine type of Arizona on 10 measurement dates. Multi-ple regression analyses utilizing these data produced several significant equations for predicting the 'net' effect of an opening in the ponderosa pine type of Arizona. In addition, the significant equations yielded site information, within the range of conditions studied, which could be utilized to maximize or minimize the 'net' effect of openings, depending upon the desired land management objectives. Knowledge of these site variables could aid the land manager in decisions concerning the location and size of proposed timber cuts in situations where water yield from snowpacks is an important consideration.
W75-05764

WAMIS ABSTRACTS, NO. 1, Arizona Univ., Tucson. Dept. of Watershed Management.

For primary bibliographic entry see Field 10A. W75-05767

A DECISION-AIDING MODEL FOR PLANNING OPTIMAL RESOURCE ALLOCATION OF WATER BASINS,
Arizona Univ., Tucson. Dept. of Watershed

Management.

For primary bibliographic entry see Field 6A. W75-05770

PROCEDURE FOR ESTIMATING TOTAL FLOOD DAMAGE IN URBAN AREAS. Colorado State Univ., Fort Collins. Dept. of Civil

Engineering.
N. S. Grigg.
Available from the National Technical Information tion Service, Springfield, Va 22161 as PB-240 469, \$3.25 in paper copy, \$2.25 in microfiche. (1974). 3 p, 3 ref. OWRT B-113-COLO(3).

Descriptors: City planning, *Drainage, Economic analysis, *Flood control, *Flood damage, Estimating, *Urban drainage, *Damages.

When flooding occurs in urban areas the category of damage normally reported in the press and therefore receiving most attention, is direct damage to property. This is, however, only one of about five empirical categories of flood damages. The five categories are: direct damages, indirect damages, secondary damages, intangible damages, uncertainty damages. These categories of damage are discussed according to how they affect urban drainage decisions. W75-05776

CRITERIA FOR EVALUATION OF URBAN DRAINAGE AND FLOOD CONTROL,
Colorado State Univ., Fort Collins, Dept. of Civil

Engineering.

N. S. Grigg Available from the National Technical Informa-Available Holm the National Technical Information Service, Springfield, Va 22161 as PB-240 449, \$3.75 in paper copy, \$2.25 in microfiche. Presented at Urban Drainage Seminar, April 1974. 25 p, 3 tab, 6 fig, 16 ref. OWRT B-113-COLO(1).

Descriptors: *City planning, *Drainage, Economic analysis, *Flood control, *Flood damage, *Urban drainage, Evaluation, *Benefits, Standards.

The evaluation of urban drainage and flood control (UDFC) projects is a familiar problem to engineers in the public sector. On the one hand, public works managers are faced with the problem of procuring funds for UDFC projects which requires that the project benefits be clearly enunciated. Benefits for UDFC projects can best be understood by breaking UDFC systems into major and minor subsystems and thereafter considering major drainage mostly as a protective service and minor drainage mostly as an environmental management service. In this regard, the use of traditional evaluation tools is more applicable to the major system evaluation problem because of the quantifiable nature of the direct benefits (damage reduction). The evaluation of minor drainage systems is restricted to the procedure of setting drainage standards and criteria, then finding minimum cost solutions for meeting the standards. This approach can be part of a healthy political evaluation procedure in which community objectives are discussed in the light of willingness to pay. W75-05778

A SYSTEMS APPROACH TO THE OPERATION OF FLOOD CONTROL RESERVOIRS.

Illinois Univ., Urbana. Dept. of Civil Engineering. J. E. Schaufelberger.

Available from the National Technical Informa-Avanata Home Handbar Technical Information Service, Springfield, Va 22161 as PB-240 451, \$7.00 in paper copy, \$2.25 in microfiche. PhD Thesis, 1971. 178 p, 46 fig, 21 tab, 86 ref, 3 append. OWRR B-030-ILL(8). 14-31-0001-1899.

Descriptors: *Systems analysis, Dynamic programming, *Flood control, *Reservoir operation, *Indiana, *Regression analysis, Optimization, Multiple-purpose reservoirs, Equations, Model

Identifiers: *Wabash River(Ind), Operation policy.

This study was aimed at the presentation of a systems approach for determining operating policies for systems of flood control reservoirs. The Upper Wabash River Basin in Indiana was used since it was well gaged and excellent economic data were available. Routing equations were developed by multiple linear regression analysis based upon the linear Muskingum routing model. Flood damage was determined as a function of a peak discharge and the time of year. While investigating the characteristics of flood control systems, it was concluded that dynamic programming is applicable for the optimization of the systems operation. After near optimal solutions were obtained for the five-year period of 1957 through 1961, they were analyzed by multiple linear regression analysis to determine an operating release equation for each reservoir. Operation from the operating equation provided a greater reduction in flood damage than did the actual operations. The systems approach for determining operating policies for flood control systems was determined to be successful. Other parameters might be used in characterizing the flood; the development of a stochastic model to replace the deterministic optimization model would teresting extension. Further studies should be made concerning multiple purpose systems and economic tradeoffs. (Chow-Illinois) W75-05784

COMMERCIAL NAVIGATION ON THE UPPER MISSISSIPPI: ECONOMIC AND ENVIRON-MENTAL CHOICES, Minnesota Univ., St. Paul. Dept. of Agricultural

and Applied Economics.
For primary bibliographic entry see Field 6E.

A SOCIO-ECONOMIC EVALUATION OF ALTERNATIVE WATER MANAGEMENT POLICIES ON THE RIO GRANDE IN NEW MEXICO, New Mexico State Univ., University Park. Dept.

For primary bibliographic entry see Field 6B. W75-05790

EVALUATION OF POPULATION GROWTH AND PER CAPITA CONSUMPTION OF WATER

ON THE REGIONAL ECONOMIC GROWTH IN THE RIO GRANDE REGION IN NEW MEXICO, New Mexico State Univ., University Park. Dept. of Agricultural Economics. For primary bibliographic entry see Field 6B. W75-05791

EROSION EFFECT ON SOIL FAUNA UNDER

EROSION EFFECT ON SOIL FAUNA UNDER DIFFERENT CROPS,
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 2J.
W75-05793

CONTROL OF WATER CHESTNUT WITH 2.4-D AMINE.

Army Engineer District, New York. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as AD-784 351, \$3.75 paper copy, \$2.25 microfiche. Final Environmental Statement, August 1971. 27 p.

Descriptors: *Herbicides, *Aquatic plant control, *New York, Spraying, Water supply, Hudson River, Recreation, 2,4-D, Water resources, Rates of application, Rooted aquatic plants.

Identifiers: *Water chestnut, Mohawk River(NY), Environmental Impact Statements.

This Environmental Impact Statement describes the method to be employed for eradicating waterchestnut. Large, dense stands are to be chemically treated and small infestations are to be hand-pulled. Spraying is done both by hand and by boat. The chemical formulation found to give the best results is undiluted 2,4-D at four pounds acid equivalent applied at a minimum rate of 1-2 gallon/acre. No spraying will take place in the immediate vicinity of water supply intakes nor for a distance of 1000 feet upstream of the intake. Control of waterchestnut in the Hudson and Mohawk Rivers would open up about 1000 additional acres of new water for sport fishing and about 350 acres for hunting. Boating, a recreational activity hampered by the existence of waterchestnut, would no longer be restricted due to the weed. The adverse environmental effects are the profligation of duckweed due to the release of nutrients from the deteriorating waterchestnut plants. Cutting has proved costly and inefficient and air spraying had drift problems. There have been no observable negative long term effects on fish or waterfowl as a consequence of using 2,4-D. (Jones-Wisconsin) W75-05806

THE EFFECTS OF DRAINAGE AND ASSOCIATED DEVELOPMENT IN THE BIG CYPRESS SWAMP, Bureau of Sport Fisheries and Wildlife, Atlanta,

For primary bibliographic entry see Field 6G.

CONTROL APPARATUS FOR A WATER

SUPPLY SYSTEM, Weil-McLain Co., Inc., Dallas, Tex. (assignee) For primary bibliographic entry see Field 8C. W75-05817

4B. Groundwater Management

CHEMICAL ENGINEERING DIVISION, WASTE MANAGEMENT PROGRAMS, QUARTERLY REPORT, APRIL-JUNE 1974, Argonne National Lab., Ill.

For primary bibliographic entry see Field 5D. W75-05383

INVESTIGATION AND VERIFICATION OF A MODEL FOR THE DISPERSION COEFFICIENT TENSOR IN FLOW THROUGH ANISOTROPIC,

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Groundwater Management—Group 4B

HOMOGENEOUS, POROUS MEDIA WITH AP-PLICATION TO FLOW FROM A RECHARGE WELL THROUGH A CONFINED AQUIFER, Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 2F. W75-05458

FILTRATION ANALYSIS OF FOUR DIFFERENT FILTER FABRICS, Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 185, \$4.75 in paper copy; \$2.25 in microfiche. M.S. The-sis, 1970. 75 p, 13 fig, 2 tab, 45 ref. OWRT A-021-KAN(3). 14-01-0001-1084.

Descriptors: *Filtration, *Water treatment, Water purification, Water resources. Identifiers: *Filter fabrics.

The purpose was to analyze the filtration performance of four different filter fabrics. These filter cloths consisted of the following: one monofilament polypropylene cloth, two multifila-ment polypropylene cloths of different porosities, and one multifilament nylon cloth. For testing these cloths the apparatus was composed of a feed tank, a centrifugal pump, and pressure regulating valve, a pressure gauge, a column two inches in diameter to support filter cloth, and an effluent tank in which the water level was recorded by time. The results showed that flow through the filter could be mathematically predicted. Filtration was found to be dependent upon the cake and in-dependent of the filter cloth. The only requirement in selecting the filter cloth is that the pore openings in the cloth be small enough to allow the formation of a cake. The filter cake was found to be compressole as the pressure was increased, and the resistance to flow in the cake, a result of the compressibility increased linearly as a function of the absolute pressure squared. At increased pressure the flow through the filter is dependent upon the resistance to flow in the cake as described previ-ously. The samples taken ahead of and behind the filter showed that large amounts of turbidity could be removed. Most of the turbidity is removed in the cake. Some particles bleed through the cloth after once having formed as cake. W75-05460

THE USE OF BOUNDING WELLS TO CONTROL FLUX IN UNDERGROUND WATER STORAGE PROJECTS, Louisiana State Univ., Baton Rouge. Dept. of

Petroleum Engineering.

Petroleum Engineering. E. J. Langhette, III. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 017, \$5.25 in paper copy; \$2.25 in microfiche. M.S. The-sis, August 1974. 92 p, 11 fig, 1 tab, 14 ref, 2 ap-pend. OWRT A-027-LA(4). 14-31-0001-3818.

Descriptors: Groundwater recharge, *Water storage, Injection wells, *Flow, Recharge wells, Hydraulics, Artificial recharge, Computer programs, *Underground storage, Aquifer characteristics.

Identifiers: *Bounding wells, Flux, Saline aquifers.

The theoretical feasibility of using a peripheral well field to negate the effects of pre-existing fluid movement (flux) over a circular area of arbitrary size was investigated. This would render the area fit for water storage. Such a bounding well field would contain both production and injection wells and would be operated in such a way as to balance offtake and injection. A computer program has been written which calculates the bounding well flow rates which will cause the storage boundary to become a circular isopotential. The program utilizes the principle of superposition to establish a

potential balance at a number of points on the desired boundary circle. This yields a set of simultaneous equations in the unknown flow rates which is solved by a type of Gauss-Jordan elimination. The results of many computer runs indicate that as few as six properly placed bounding wells will usually negate the effects of flux to a degree sufficient for practical purposes. Furthermore, the rates at which these wells must be operated are readily obtainable with current technology. For a desired storage volume, the required bounding well rates are shown to be a function of pre-existing potential gradient, aquifer properties, and the number and location of the bounding wells. W75-05464

STORAGE OF FRESH WATER IN SALINE AQUIFERS USING A WELL FIELD, Louisiana State Univ., Baton Rouge. Dept. of

W. R. Whitehead.

Available from the National Technical Informa-Nation First the National Technical Information Service, Springfield, Va 22161 as PB-240 009, \$6.25 in paper copy; \$2.25 in microfiche. PhD Dissertation, August 1974. 142 p, 19 fig, 6 tab, 30 ref, 5 append. OWRT A-022-LA(3). 14-31-0001-4018.

Descriptors: Groundwater, *Water storage, Multi-well injection, Hydraulics, *Flow, Water supply, Groundwater recharge, Injection wells, Recharge wells, Artificial recharge, Aquifers, wells, Artificial recnarge,
*Underground storage, Cost comparisons, Mixing, Dispersion. Identifiers: *Saline aquifers, Multi-well injection.

The computational procedure presented should enable the practicing engineer to design well fields for storage of fresh water in horizontal saline aquifers in which there is no pre-existing groundwater movement. The recovery efficiency of the injection/storage/retrieval process can now be re-liably computed, making possible an economic analysis of the process in any specified area. An economic comparison of storage of approximately one billion gallons in a saline aquifer that underlies the New Orleans area was made with the present most feasible alternate--steel tanks. The results favored the saline aquifer storage project by a factor of more than 50 to 1. Recovery efficiencies obtained from a laboratory-size miniature aquifer were compared with recovery efficiencies predicted by the computational procedure. The computational procedure predicted the experimental data within 10 percent for multiple well systems. The predicted recovery efficiencies were invariably lower than the experimentally determined recovery efficiencies. The two most important fac-tors which determine the amount of usable water that can be recovered are: (1) mixing of the two fluids due to molecular diffusion and convective dispersion, and (2) gravitational segregation of the two fluids due to density difference. W75-05465

POROSITY AND HYDROLOGY OF JOINTED MIDDLE ORDOVICIAN LIMESTONES IN THE J. PERCY PRIEST DAM AREA OF CENTRAL TENNESSEE Vanderbilt Univ., Nashville, Tenn. Dept. of

Geology. For primary bibliographic entry see Field 2F. W75-05470

AQUIFER TESTS IN LARGE DIAMETER WELLS IN INDIA, Geological Survey, Menlo Park, Calif. E. A. Sammel.

Ground Water, Vol 12, No 5, p 265-272, September-October, 1974. 1 fig, 24 ref.

Descriptors: *Aquifer testing, *Data collections, *Shallow wells, Dug wells, Well data, Specific capacity, Drawdown, Fracture permeability. Identifiers: *India, Large-diameter well, Semilog

In areas of crystalline and basaltic rocks in India, dug wells of large diameter may offer the only opportunity to test for the hydrologic characteristics of the shallow aquifers. If the volume of water stored in the wells contributes significantly to their discharge during tests, analysis of test results is difficult. In most dug wells, the time rate and spatial distribution of drawdowns in the aquifer, and the rate of change of head are not predicted by the Theis equation. High pumping rates result in dif-ficulties due to the insensitivity of head distribu-tions to drawdowns in the well. Serious theoretical and practical deficiencies exist in current methods of aquifer test analysis in large-diameter wells. The best available approaches are Papadopulos and Cooper (1967) and Papadopulos (1967). Aquifer tests in fractured rock can best be handled by treating the aquifer as an anisotropic porous medium on a macroscopic scale and utilizing ob-servation wells. (Bradbeer-NWWA) W75-05501

DISSOLVED ORGANIC CARBON (DOC), AN INDEX OF ORGANIC CONTAMINATION IN GROUND WATER NEAR BARSTOW, CALIFORNIA, Geological Survey, Garden Grove, Calif. Water

Resources Div.

For primary bibliographic entry see Field 5A. W75-05502

GROUND WATER ACTIVITIES IN THE USGS, Geological Survey, Washington, D.C. Ground Water Branch.

G. Meyer. Water Well Journal, Vol 28, No 11, p 43-45, November, 1974.

Descriptors: *Groundwater, *Water utilization, *Administration, *Research priorities, Water resources development, Organizations.

The world has rediscovered water as a resource and seeks information -- more information than is available. The United States Geologic Survey is a principal source of public information and should respond readily to the new interest in water resources and the control of them. Five principal trends in the use of ground water and aquifers have recently been surfacing. First, there is a consistent increase in utilization of ground water and programs to assess ground water as a water resource and provide standard answers to standard questions about development, management and quality. Second, aquifers will be examined more intensively as water management facilities. Third, there is a rising interest in saline aquifers, not particularly for their potential for a desalinated water supply, but for development of understanding of aquifer systems. Fourth, subsurface waste disposal is looming as a problem in environmental geology and must be controlled. The last trend is a general new interest in the subsurface that demands supporting groundwater knowledge geothermal energy, environmental protection, oil shale, subsidence, earthquake management and many more. The great variety of new interest is a many more. The great variety of new interest is a powerful argument for orderly programs of deep and shallow geologic and ground water investiga-tion, on which special studies of immediate problems can ride piggyback. (Bradbeer-NWWA) W75-05503

DISPOSAL OF HAZARDOUS WASTES. Geological Survey, Denver, Colo. For primary bibliographic entry see Field 5G. W75-05504

GROUNDWATER MODELS FOR TEXAS. Texas Water Development Board, Austin. For primary bibliographic entry see Field 2F.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

TECHNOLOGICAL LIMITATIONS GROUND-WATER MANAGEMENT, Guyton (William F.) and Associates, Houston, For primary bibliographic entry see Field 6E.

ARTIFICIAL RECHARGE - A POTENTIAL SOLUTION FOR MANY WATER PROBLEMS, Ohio State Univ., Columbus. Dept. of Geology. W. A. Pettyjohn.

Water Well Journal, Vol 38, No 9, p 48-51, Sep-

tember, 1974, 1 tab.

W75-05510

Descriptors: *Artificial recharge, Water spreading, Injection wells, Management, Water supply, Water management(Applied), Ohio, North Dakota

Identifiers: Minot(N Dak), Dayton(Ohio), Souris

Artificial recharge is a means of augmenting the natural infiltration of surface water into a ground water reservoir by wells, water spreading, or alter-ing natural conditions. Water commonly used for artificial recharge includes natural stream flow, high flows diverted from a nearby water course, cooling waters, diverted storm drainage water, or sludge effluent (treated or untreated). Increase in production of ground water supplies, and water quality control (through prevention of saline water encroachment or through addition of higher quality water to contaminated water) are uses of artificial recharge. Several examples of artificial recharge programs, including the program instituted in Minot, North Dakota in 1964 and the recharge system of Dayton, Ohio, illustrate the advantages of artificial recharge. (Bradbeer-NWWA) W75-05511

GEOLOGY AND GROUND WATER RESOURCES OF SUSSEX COUNTY AND THE WARREN COUNTY PORTION OF THE TOCKS

ISLAND IMPACT AREA, New Jersey Dept. of Environmental Protection, Trenton. Div. of Water Resources.

I. W. Miller, Jr.

Bureau of Geology and Topography, Bulletin 73, 1974. 143 p, 6 fig, 12 tab, 59 ref.

Descriptors: *Hydrology, *Groundwater, Stratigraphy, Fracture permeability, *New Jersey, Chemical analysis, Geology. Identifiers: *Tock Island area(NJ).

Sussex County and the Warren County, New Jersey portion of the Tocks Island Impact Area are primarily agricultural. Commercial, industrial, and resort developments are occurring at an increasingly rapid rate. Ground water supplies approxi-mately sixty per cent of the estimated daily water consumption. Water utilities furnish the balance with surface water or a combination of ground water and surface water. Most of the ground water is obtained from rock wells; only a small percentage of the wells are located in unconsolidated Pleistocene deposits. Over 3000 records of domestic, industrial and public supply wells were examined. The interpretations and conclusions presented are based on these driller's records which, although not precise or complete, give a good indication of reasonable expectations of depth and yield for each formation. There are no known areas where ground water levels have declined because of over pumping. Domestic supplies may be developed almost anywhere in the study area. Moderate to large supplies can generally be developed from wells located in stratified drift, in cavernous members of the Kittatinny Formation and in shear zones near faults. Wells completed in Precombrian crystallines, in the non-cavernous members of the Kittatinny Formation, and in the Martinsburg Formation usually have very low yields; between 36 and 47 per cent will have yields of 5 gpm or less. The quality of ground water is generally good for most uses. Locally treatments for hardness, low pH, high iron content and high SO4 may be needed. (Bradbeer-

GEOHYDROLOGY OF PLEISTOCENE DEPOSITS AND SUSTAINED YIELD OF PRINCIPAL PLEISTOCENE AQUIFER, LAKE COUNTY, INDIANA, Illinois Univ., Urbana. Dept. of Geology. For primary bibliographic entry see Field 2F. W75-05514

THEIS EQUATION ANALYSIS OF RESIDUAL DRAWDOWN DATA,
Nevada Univ., Reno. Desert Research Inst. For primary bibliographic entry see Field 2F. W75-05519

AQUIFER CLOGGING IN COMBINED WASTE-WATER RECHARGE. Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.

For primary bibliographic entry see Field 5D. W75-05520

AN EVALUATION OF THE THEORY OF GROUND-WATER AND RIVER-WATER INTERCHANGE, WINNEMUCCA REACH OF THE HUMBOLDT RIVER, NEVADA, Nevada Univ., Reno. Desert Research Inst. For primary bibliographic entry see Field 2A. W75-05529

ENVIRONMENTAL CONTROLS ON GROUND-WATER CHEMISTRY IN NEW MEXICO. I. THE EFFECT OF PHREATOPHYTES, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience. For primary bibliographic entry see Field 2D. W75-05531

WATER OR AIR, WHICH DO YOU PUMP, FMC Corp., Indianapolis, Ind. Pump Div. For primary bibliographic entry see Field 8C. W75-05542

TREATED **EFFLUENT** GOES 'UNDERGROUND', For primary bibliographic entry see Field 5D. W75-05544

A SOIL AND GROUND-WATER POLLUTANT TRANSPORT MODEL, Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div. For primary bibliographic entry see Field 5B. W75-05581

STUDY OF FLUID MOVEMENTS THROUGH CAUSEWAY, Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2F.
W75-05610

A NUMERICAL TECHNIQUE FOR AQUIFER EVALUATION, Illinois Univ., Urbana. Dept. of Geology. For primary bibliographic entry see Field 2F. W75-05612

VALUATION OF A GROUND-WATER SUPPLY FOR MANAGEMENT AND DEVELOPMENT, Nevada Univ., Reno. P. A. Domenico. Ph D Dissertation 1967. 63 p, 8 fig, 39 ref.

Descriptors: "Groundwater, "Management, Safe yield, Economics, Sustained yield, Overdevelopment, Property, "Nevada, "Water supply. Identifiers: "Great Basin(Nev), Extra-social costs.

An attempt is made to analyze problems of are attempt: a made with a management and development in terms of valuation of a resource or property that represents a source of future money receipts. An analytical expression is derived which gives both present worth of gains forthcoming from resource exploitation over a variable time period and the remaining worth of a ground-water supply after it has been partially depleted. With water-level posi-tion selected as the denominator common to both the system and its economic worth, a course of ex-ploitation is charted so that (1) present worth of future returns is maximized, and (2) water rights are protected to the extent that water levels are not lowered below the economic limit of pumping. The results enable a conceptual valuation of (1) sion rules for efficiency in management, (2) op-timal mining yield for specified conditions and (3) the state of development of the resource at any time. (Bradbeer-NWWA) W75-05613

ANALYSIS OF SHALLOW HARD ROCK WELL PUMPING AND RECOVERY TEST DATA, Kaunasskii Politekhnicheskii Institut (USSR). For primary bibliographic entry see Field 8G. W75-05615 Hydraulic Div

PRESSURE BUILDUP AND DRAWDOWN BEHAVIOR IN UNDERSATURATED RESERVOIRS OF DISCONTINUOUS PERMEABILITY, Stanford Univ., Calif. Dept. of Petroleum Engineering. D. A. Rowland.

PhD Dissertation 1969. 116 p, 26 fig, 9 tab, 80 ref.

Descriptors: *Mathematical models, Hydraulic Descriptors: "Mathematical models, Hydraulic models, Hydraulic properties, "Permeability, Variability, Heterogeneity, "Drawdown, Aquifer tests, Penetration, "Reserviors, "Pressure. Identifiers: Skin effect, Fractional penetration, Flow capacity, Horizontal fracture effect, Composite reservoirs, Stratified reservoirs, Lenticular reservoirs.

Analytical expressions developed for evaluating the results of pressure testing are based generally on the assumption of homogeneous rock properties, even though reservoir inhomogeneities such as faulting, lensing, stratification, fracturing, and anisotrophy introduce anomalies in the test data and may affect calculation accuracy. Analysis of results from mathematical models developed indicates that when vertical nemeability variation dicates that when vertical permeability variation exists, the determination of skin effect and flow capacity may be performed in the usual manner. Whenever radial discontinuities exist, considerable differences in computed values and actual values of skin effect result. A method was developed for determining true skin effect in the presence of radial discontinuities. It gives reliable results in composite and lenticular reservoir systems. Skin effect evaluations in partially-penetrated reservoirs may be made by applying the Brons and Marting pseudo-skin effect cor-rection factors and an additional factor due to the fact that the flow rates through the damaged gion increased proportionally to the reciprocal of the fractional penetration. Horizontal fractures and shale barriers may also be treated as skin ef-fects in partially penetrated wells. Here again the recis in partially penetrated wells. Here again the true skin effect to be used in designing remedial programs is obtained after correcting for the in-creased flow rate through the damaged area. (Campbell-NWWA) W75-05617

A THEORETICAL STUDY ON THE IN-TERPRETATION OF RESISTIVITY SOUNDING

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Groundwater Management—Group 4B

DATA MEASURED BY THE WENNER ELEC-TRODE SYSTEM, Missouri Univ., Rolla, Dept. of Geophysical En-

Missouri Univ., Rolla. Dept. of Geophysical Engineering. For primary bibliographic entry see Field 8G. W75-05618

DIGITAL SIMULATION OF A STREAM-AQUIFER SYSTEM, Illinois Univ., Urbana. Dept. of Geology. For primary bibliographic entry see Field 2F. W75-05620

CHANGES IN CONCENTRATION OF CERTAIN CONSTITUENTS OF TREATED WASTE WATER DURING MOVEMENT THROUGH THE MAGOTHY AQUIFER, BAY PARK, NEW YORK,

YORK, Geological Survey, Mineola, N.Y. For primary bibliographic entry see Field 5B. W75-05625

MOBILIZATION OF IRON IN WATER IN THE MAGOTHY AQUIFER DURING LONG-TERM RECHARGE WITH TERTIARY-TREATED SEWAGE, BAY PARK, NEW YORK, Geological Survey, Mineola, N.Y. For primary bibliographic entry see Field 5B. W75-05626

NORMAN CREEK, A SOURCE OF RECHARGE TO MARAMEC SPRING, PHELPS COUNTY, MISSOURI.

Geological Survey, Rolla, Mo. For primary bibliographic entry see Field 2F. W75-05627

CHEMICAL AND PHYSICAL DATA FOR DISPOSAL WELLS, EASTERN SNAKE RIVER PLAIN, IDAHO,

Geological Survey, Boise, Idaho. For primary bibliographic entry see Field 5B. W75-05632

EVALUATION OF HYDRAULIC CHARAC-TERISTICS OF A DEEP ARTESIAN AQUIFER FROM NATURAL WATER-LEVEL FLUCTUA-TIONS, MIAMI, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 2F. W75-05633

GROUND-WATER RESOURCES OF GRIMES COUNTY, TEXAS.

Geological Survey, Austin, Tex. E. T. Baker, jr., C. R. Follett, G. D. McAdoo, and C. W. Bonnet.

Texas Water Development Board, Austin, Report 186, September 1974. 109 p, 26 fig, 10 tab, 28 r⇒f.

Descriptors: *Groundwater, *Texas, *Water supply, Water yield, Hydrogeology, Aquifers, Saline water, Irrigation water. Identifiers: *Grimes County(Tex).

Fresh to slightly saline groundwater is available everywhere in Grimes County, Texas. The Yegua Formation, Jackson Group, Catahoula Sandstone, Fleming Formation, and flood-plain alluvium are the sources of almost all water presently (1971) being pumped. The Carrizo, Queen City, and Sparata Sands have varying capacities for potential development, but are not tapped by wells. The Willis Sand and terrace deposits contain only small quantities of water, are tapped by only a few wells, and have a relatively small areal extent. Only 1.63 million gallons per day of groundwater were used for all purpose in 1970. Of this amount, 53% was used for public supply, 38% for irrigation, and 9% for rural-domestic and livestock needs. Because of the small pumpage, regional

water-level declines have been insignficant. The groundwater is of good chemical quality. Much of it is suitable for public-supply, rural-domestic, and industrial use with little or no treatment; and the overall appraisal of the groundwater for irrigation with respect to plant growth and soil effects is favorable. The better quality water, in general, is associated with the younger aquifers. A total of 52 mgd of fresh to slightly saline water is also available on a long-term basis. Wells that are properly constructed can be expected to yield more than 500 gpm from most of the aquifers. (Knapp-USGS)

ANALOG-MODEL STUDIES OF GROUND-WATER HYDROLOGY IN THE HOUSTON DIS-TRICT, TEXAS,

Geological Survey, Austin, Tex. D. G. Jorgensen. Texas Water Development Board, Austin, Report 190, February 1975. 84 p, 40 fig, 3 tab, 25 ref.

Descriptors: *Subsidence, *Artesian aquifers, *Analog models, *Texas, Withdrawal, Compaction, Water resources development, Safe yield, *Groundwater.
Identifiers: *Houston(Tex).

The major water-bearing units in the Houston district of Texas are the Chicot and the Evangeline aquifers. The Chicot aquifer overlies the Evangeline aquifers, which is underlain by the Burkeville confining layer. Both aquifers consist of unconsolidated and discontinuous layers of sand and clay that dip toward the Gulf of Mexico. Heavy pumping of freshwater has caused large declines in the altitudes of the potentiometric surfaces in both aquifers and has created large cones of depression around Houston. The declines have caused compaction of clay layers, which has resulted in land-surface subsidence and the movement of saline groundwater toward the centers of the cones of depression. An electric analog model was used to study the hydrologic system and to simulate the declines in the altitudes of the potentiometric surfaces for several alternative plans of groundwater development. The results indicate that the largest part of the pumped water comes from storage in the water-table part of the Chicot aquifer. Development of additional groundwater supplies from the water-table part of the Chicot aquifer north of Houston would result in a minimum decline of the altitudes of the potentiometric surfaces. Total withdrawals of about 1,000 million gallons per day may be possible without seriously increasing subsidence or saltwater encroachment. Both land surface subsidence and saltwater encroachment could be reduced by artificially recharging the artesian part of the aquifer. (Knapp-USGS)

LAND-SURFACE SUBSIDENCE IN THI HOUSTON-GALVESTON REGION, TEXAS, Geological Survey Houston Tex

Geological Survey, Houston, Tex. R. K. Gabrysch, and C. W. Bonnet. Texas Water Development Board, Austin, Report 188, February 1975. 19 p, 12 fig, 6 ref.

Descriptors: *Subsidence, *Land subsidence, *Texas, Withdrawal, Artesian aquifers, Compaction, Water wells, Groundwater, Pumping. Identifiers: *Houston(Tex), *Galveston(Tex).

The pumping of large amounts of groundwater in the Houston-Galveston region, Texas, has resulted in water-level declines of as much as 200 feet in wells completed in the Chicot aquifer and as much as 325 feet in wells completed in the Evangeline aquifer during 1943-73. The maximum average annual rates of decline for 1943-73 were 6.7 feet in the Chicot aquifer and 10.8 feet in the evangeline aquifer. During 1964-73, the maximum rates were 10 feet in the Chicot and 17.8 feet in the Evangeline. The declines in artesian pressures

have resulted in pronounced regional subsidence of the land surface. The center of subsidence is at Pasadena, where as much as 7.5 feet of subsidence occurred between 1943 and 1973. More than 1.0 foot of subsidence occurred at Pasadena between 1906 and 1943. The maximum amount of subsidence during 1964-73 was about 3.5 feet. In the Southern part of Harris County, about 55% of the subsidence is a result of compaction in the Chicot aquifer. The area in which subsidence is 1 foot or more has increased from about 350 square miles in 1954 to about 2,500 square miles in 1973. Estimates of subsidence are based on the amount of water level decline, the thickness of the clay, and the compressibility of the clay. At Seabrook, it is estimated that for each 1 foot of average water-level decline, 1 foot of average water-level decline, 1 foot of average water-level decline, 1 foot of subsidence would occur. Planned use of surface water instead of groundwater will probably result in some recovery of artesian pressures. If pressure recovery occurs the rate of subsidence should decrease substantially in the more critical areas. (Knapp-USGS)

HYDROGEOCHEMISTRY OF THE NORTHERN YUCATAN PENINSULA, MEXICO, WITH A SECTION ON MAYAN WATER PRACTICES, Geological Survey, Reston, Va. For primary bibliographic entry see Field 2F. W75-05647

MID-1971 GROUND-WATER CONDITIONS AT YANKEETOWN WELL FIELD, LEVY COUN-TY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 2F. W75-05649

APPLICATION OF STATISTICAL TECHNIQUES TO THE ESTIMATION OF GROUND-WATER WITHDRAWALS IN NORTHWESTERN KANSAS,

Geological Survey, Lawrence, Kans. W. M. Kastner.

Available from NTIS, Springfield, Va 22161, as PB-239 018, \$3.25 in paper copy, \$2.25 in microfiche. Water-Resources Investigations 41-74, November 1974. 11 p, 5 ref.

Descriptors: *Groundwater mining, *Withdrawal, *Statistical models. Estimating, Water supply, Planning, Methodology, Analytical techniques, Statistical methods, *Kansas. Identifiers: *Ogallala formation(Kan).

A study was made to determine the accuracy of using readily available data with statistical techniques to estimate groundwater withdrawals in western Kansas. The data were from a sample of wells chosen from the total inventoried irrigation wells in nine counties in northwestern Kansas. The hypothesis that each of 3 physical characteristics of the wells had the same distribution in the sample as in the total population was accepted at the 95% significance level. These characteristics (saturated thickness of the aquifer, depth to water below land surface, and reported well yield) were assumed to be related to the withdrawal of the wells, and the sample was considered to be representative of the total population in regard to groundwater withdrawals. Metered withdrawal values for the wells were not available, so derived withdrawals were obtained by using power-conversion coefficients to convert power records to pumpage. The power-conversion coefficient is the ratio of values obtained in short simultaneous measurements of power use and discharge for a well. Trend-surface and multiple-regression analyses were performed on the power-conversion coefficients and on the pumpage per irrigated acre derived from the coefficients. The equations developed using the available data proved to be

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poor tools for estimating withdrawals. All the expected relationships appeared to be either very weak or nonexistent. The expected relations may actually be weak; however, a more likely conclusion is drawn that the withdrawal values, which have been derived using the power-conversion coefficients and the available data, do not reflect the true withdrawals. (Woodard-USGS) W75-05651

A TAX SYSTEM FOR GROUNDWATER MANAGEMENT, Geological Survey, Reston, Va. For primary bibliographic entry see Field 6C. W75-05654

CHEMICAL INTERACTION DURING DEEP WELL RECHARGE, BAY PARK, NEW YORK, Geological Survey, Mineola, N.Y. Water Resources Div. For primary bibliographic entry see Field 5B. W75-05656

MANAGEMENT OF SUBSIDING LANDS: AN ECONOMIC EVALUATION, Arizona Univ., Tucson. Dept. of Hydrology and

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 305, \$4.75 in paper copy; \$2.25 in microfiche. PhD Dissertation, 1973. 70 p, 8 fig, 4 tab, 38 ref, append. OWRT A-030-ARIZ(1). 14-31-0001-3503.

Descriptors: "Land subsidence, "Groundwater, Overdraft, Evaluation, "Management, "Arizona, Aquifers, Costs, Damages, Cost-benefit analysis, "Alternative costs, "Alternative planning. Identifiers: Economic analysis.

Land subsidence as a result of removal of ground-water is a common occurrence in many areas of the world. In south-central Arizona, subsidence of agricultural land over a groundwater aquifer offered a simplified economy against which the economic importance of subsidence could be tested. To perform the test, all of the various damages that are caused by subsidence were inventoried. Costs of damages were evaluated by the use of Benefit-Cost Analysis with alternative management proposals. The impact of subsidence-caused damages to the economy of the study area was almost negligible. Furthermore, no steps could be recommended to halt subsidence because of the excessive cost of halting water pumping and imported water.

NEW PRIORITIES FOR GROUND-WATER QUALITY PROTECTION, Geraghty and Miller, Port Washington, N.Y. For primary bibliographic entry see Field 5B. W75-05827

NUMERICAL ANALYSIS OF PUMPING FROM CONFINED-UNCONFINED AQUIFERS, Birmingham Univ. (England). Dept. of Civil Engineering. K. R. Rushton, and A. Turner.

gineering. K. R. Rushton, and A. Turner. Water Resources Bulletin, Vol 10, No 6, p 1255-1269, December 1974. 8 fig, 1 tab, 8 ref.

Descriptors: "Groundwater movement, "Confined water, "Mathematical studies, "Numerical analysis, "Aquifers, Aquifer characteristics, Water wells, Aquifer testing, "Drawdown, Porous media, Storage coefficient, Analytical techniques, Equations, Dewatering, Unsteady flow, Finite element analysis, Digital computers, "Pumping. Identifiers: Type curves.

A numerical method was presented for the analysis of a pumped well in a homogeneous aquifer

with allowance made for the decrease in saturated depth, vertical components of flow, the possibility of regions of the aquifer changing between the confined and unconfined states, and the effect of different outer boundaries. The method was based on a discrete space, backward difference time, approximation. A particular example considered in detail concerned heavy pumping from one of a regular array of wells in an unconfined aquifer until the drawndown in the well reached a critical value. Nondimensional curves were presented relating the time and volume dewatered to the quantity discharged from the well. A further example investigated the effect of an initial confining pressure on the aquifer behavior. (Prickett-ISWS) W75-05835

4C. Effects On Water Of Man's Non-Water Activities

CHLORIDES IN LAKE ERIE BASIN, State Univ. of New York, Buffalo. Dept. of Civil Engineering. For primary bibliographic entry see Field 5B. W75-05355

THE INFLUENCE OF BIG CYPRESS LAND DEVELOPMENT IN THE DISTRIBUTION OF HEAVY METALS IN EVERGLADES ESTUARIES,

Florida State Univ., Tallahassee. Marine Lab. For primary bibliographic entry see Field 5B. W75-05434

THE IMPACT OF ENERGY DEVELOPMENT ON WATER RESOURCES IN ARID LANDS, LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,

Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3E.
W75-05471

AN ANNOTATED BIBLIOGRAPHY OF THE EF-FECTS OF LOGGING ON FISH OF THE WESTERN UNITED STATES AND CANADA, Washington Univ., Seattle. Coll. of Fisheries. For primary bibliographic entry see Field 5C. W75-05500

MOISTURE AND DENSITY RELATIONS ON GRADED STRIP-MINE SPOILS,

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. W. R. Curtis.

In: Ecology and Reclamation of Devastated Land. Vol. 1. R. J. Hutnik, and G. Davis, (editors). Gordon and Breach, NY., p 135-144, 1973. 2 fig, 2 tab, 6 ref.

Descriptors: *Strip mines, *Appalachian Mountain region, *Moisture content, *Soil density, *Grading, Topography.

The disposition of moisture in strip-mine spoil in relation to grading compaction is important to the successful establishment of a vegetative cover. A study of subsurface moisture and density on a graded spoil on an area-type mining operation showed 'valley' sites to be about 20 pounds per cu ft less dense than the 'ridge' sites. Except for the surface layer there was more moisture available to plants in the 'valley' areas. Ridge and valley locations refer to topography of spoil prior to grading. Indications are that deep-rooted plants may be better adapted to spoil environments than shallow-rooted species. (Forest Service)

EFFECTS OF STRIP MINING ON THE HYDROLOGY OF SMALL MOUNTAIN WATERSHEDS IN APPALACHIA, Forest Service (USDA), Berea, Ky. Northeastern

Forest Experiment Station. W. R. Curtis,

In: Ecology and Reclamation of Devastated Land. Vol. 1. R. J. Hutnik, and G. Davis, (editors). Gordon and Breach, New York, p 145-157, 1973. 3 fig, 2 tab, 25 ref.

Descriptors: *Strip mines, *Appalachian Mountain region, *Turbidity, *Dissolved solids, Sediments, Hydrology, Streamflow, *Small watersheds, *Kentucky.

Identifiers: Peak discharge.

Strip mining in Appalachia is generally considered to have pronounced adverse effects on the hydrology of affected watersheds. Data from six watersheds show that stream turbidity and peak flows increase during mining but turbidity returns to near pre-mining levels within six months or so. Total dissolved solids content of streamflow increases significantly. Knowledge of the influence of strip mining on the water resource is useful in the design of standards for control of adverse effects and is basic to the development of improved mining and reclamation methods. (Forest Service) W75-05593

EFFECTS OF STRIP MINING ON SMALL-STREAM FISHES IN EAST-CENTRAL KEN-TUCKY,

Eastern Kentucky Univ., Richmond. Dept. of Biology. For primary bibliographic entry see Field 5C. W75-05598

STRIP-MINING, EROSION AND SEDIMENTA-

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 5C. W75-05600

SIMULATED EFFECTS OF OIL-SHALE DEVELOPMENT ON THE HYDROLOGY PICEANCE BASIN, COLORADO,

Geological Survey, Reston, Va.
J. B. Weeks, G. H. Leavesley, F. A Welder, and G.
J. Saulnier, Jr.

Available from Sup Doc, GPO, Washington D.C. 20402, Price \$3.15 in paper copy, \$2.25 in microfiche. Professional Paper 908, 1974. 84 p, 56 fig, 1 plate, 13 tab, 49 ref.

Descriptors: *Mining, *Oil shales, *Colorado, Water resources, Mine water, Water demand, Mathematical models, *Simulation analysis, Dewatering, Water pollution sources, Groundwater, Surface waters. Identifiers: *Piceance Basin(Colo).

Digital models were used to simulate effects of oilshale development on the hydrologic system of the Piceance Basin, Colo. The effects of precipitation changes on the hydrologic system due to the introduction of atmospheric pollutants from oilshale development of from cloud seeding were also simulated. Each 10-percent change in precipitation results in a 40-percent change in groundwater recharge. A 10-percent decrease in groundwater recharge. A 10-percent decrease in Cotober-May precipitation results in a 30-percent decrease in mean annual runoff, whereas 10- and 20-percent increases in precipitation result in 40-and 85-percent increases in mean annual runoff. For the hypothetical dewatering scheme simulated, the model study indicates that one of the mines will not produce enough water to meet the demand for processing and disposal of oil shale, whereas another mine will produce water in excess of the demand. The concentration of dissolved solids of the water discharged from the mines would probably not exceed 5,000 milligrams per

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litre for the hypothetical dewatering scheme considered. Dewatering will only slightly affect groundwater discharge in the Yellow Creek drainage. However, after 30 years of dewatering, groundwater discharge will cease in a 10-mile reach of Piceance Creek. After 30 years of dewatering the hydraulic head in the aquifers is decreased in 75 percent of the basin area, and about 500,000 acre-feet of water is removed from storage in the aquifers. (Knapp-USGS) W75-05637

MID-1971 GROUND-WATER CONDITIONS AT YANKEETOWN WELL FIELD, LEVY COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 2F. W75-05649

FLOOD-FLOW CHARACTERISTICS OF THE CHENANGO RIVER AT PROPOSED INTERSTATE HIGHWAY IN TOWNS OF FENTON AND CHENANGO, BROOME COUNTY, NEW YORK,

Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4A.
W75-05655

A CLIMATIC MODEL OF URBAN ENERGY BUDGETS,

California Univ., Los Angeles. Dept. of Geography.
W. H. Terjung, and S. S-F, Louie.

W. H. Terjung, and S. S-F, Louie.
Geographical Analysis, Vol 6, p 341-367, 1974.
(Univ. of California Water Resources Center Project UCAL-WRC-W-237). OWRT-B-121-CAL(6).

Descriptors: *Climatic data, *Energy budget, Cities, Computer models, Landscaping, Model studies, *Temperature, *Forecasting, Identifiers: *Climatic models, *Urban landscapes.

A deductive model of the energy budgets of urban landscapes, based on the exchanges of energy, mass and momentum, is introduced. The absorption of shortwave and longwave radiation and their dissipation via the channels of reradiation, concuction, conduction, and evaporation are generated by the model in order to simulate the interplay of the many energy cascades among the myriad of city surfaces. A city can be geographically analyzed by determining its energy budget and resultant surface temperatures on a block-by-block basis. In spite of some simplifying assumptions, the predictions of surface temperatures of this initial model compare favorably with observations. (Snyder-California, Davis) W75-05683

APPLICATION OF THE ALEKSANDRA MINERAL WATER FROM WYSOWA AND ITS SALT TABLETS IN THE TREATMENT OF DUODENAL ULCERS, (IN POLISH), Military Hospital, Poznan (Poland). For primary bibliographic entry see Field 6D. W75-05712

THE EFFECTS OF PRESCRIBED BURNING ON SAWGRASS, CLADIUM JAMAICENSE CRANTZ, IN SOUTH FLORIDA, Miami Univ., Coral Gables, Fla. For primary bibliographic entry see Field 6G. W75-05740

A TIME-SPACE TECHNIQUE TO ANALYZE SNOWPACKS IN AND ADJACENT TO OPENINGS IN THE FOREST, Arizona Univ., Tucson, Dept. of Watershed Management.

For primary bibliographic entry see Field 4A.

RUNOFF WATER QUALITY OF THREE TUC-SON WATERSHEDS.

Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics. K. R. Blackwood.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 287, \$3.75 in paper copy; \$2.25 in microfiche. Research Report, 1974. 39 p, 14 fig, 4 tab, 13 ref. OWRT B-023-ARIZ(4). 14-31-0001-3556.

Descriptors: Storms, Rainfall-runoff relationships, Urbanization, Water Management(Applied), *Water quality, *Storm runoff, *Arizona, Watershed management, Watersheds(Basins), *Urban runoff, Monitoring, Flow measurement, *Land use.

Identifiers: Urban storm runoff quality, *Tucson(Ariz).

An interdisciplinary study of three watersheds was conducted during the years of 1969 through 1973 by the Water Resources Research Center, University of Arizona, to monitor the quantity and quality of urban runoff in Tucson, Arizona. Three watersheds are drained by nearly natural drainage channels. Flow was measured by concrete critical flow measuring flumes. Quality was determined through tests run on manually collected samples taken at various intervals throughout runoff events. Because of a rapidly burgeoning popula-tion and a growing recognition of the limited water resources available to the Tucson metropolitan area, many suggestions for the use of stormwater runoff have been made. The water quality of the runoff water is presented in order to enable a better evaluation of these proposals to be made. The study was divided into three sections. The first compared the land-use and geological characteristics of the three watersheds in an attempt to determine their effect on water quality. The second section examined the variation in average water quality between storms for each watershed. Characteristics of the storms were examined to determine the possibility of predicting the water quality. Finally, water quality variations during a storm were investigated to determine if they followed a predictable pattern, and whether significant improvements in average quality of the cap-tured water could be obtained if some of the runoff water was bypassed. W75-05768

PROCEDURES FOR DEVELOPING A MODEL FOR PLANNING WATERBASED LINEAR PARKS ALONG STREAM CHANNELS IN SEMIARID URBAN REGIONS, Arizona Univ., Tucson. Dept. of Watershed

Management. For primary bibliographic entry see Field 6B. W75-05769

STATUS OF COLONIES OF LAND WADING BIRDS IN SOUTH FLORIDA, National Audubon Society, New York.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 633, \$3.25 paper copy, \$2.25 microfiche. Bureau of Sport Fisheries and Wildlife, Atlanta, Ga. Ecological Report No. DI-SFEP.74-32, June 1973. 18 p, 1 fig, 3 tab, 7 ref, 1 append.

Descriptors: *Birds, *Wildlife, *Florida, *Wading birds, Surveys, Habitats, Nests, Broods. Identifiers: *South Florida, Wood storks, Corkscrew Swamp(Fla), Egrets, Herons, Ibis.

A 1971-1972 survey was made of wading birds in south Florida in the area south of Caloosahatchec River and the St. Lucie Canal, including Lake Okeechobee, but excluding colonies within the Everglades National Park. In most cases, the colony population was determined by low-level aerial counts, but a few, careful ground counts were available. Coverage of wood stork Mycteria americana colonies was statewide. The relation of

weather and the demand for water for human use upon the bird colony sites are discussed. Without change in current trends in south Florida, wading bird populations will continue to decline. A total of 1368 breeding pairs of wood storks were counted in 1971, of which 1200 were found in Corkscrew Swamp. About 1500 storks were fledged in 1971, but only 200 fledged in 1972. Most other large wading birds did not breed in 1971 because of drought; however, about 37,000 pair (including 10,000 cattle egrets) nested in 1972. Comparison with previous counts indicates a drastic long-term decline in wading bird populations from about 2.5 million to 150,000 birds in the last 100 years. Recommendations are presented for preserving wading bird populations from an increasing loss of habitat and food supply. (Jones-Wisconsin) W75-05803

4D. Watershed Protection

LAND-USE CHANGES AND THE ECONOMIC EVALUATION OF NATURAL VIRGINIA PINE STANDS ON THE DIAL CREEK WATERSHED, DURHAM COUNTY, NORTH CAROLINA, North Carolina State Univ., Raleigh. School of Forest Resources.

H. J. Van Loock, III.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 178, \$5.25 in paper copy, \$2.25 in microfiche. M.S. Thesis Dept. of Forestry, 1972. 107 p, 10 fig, 25 tab, 33 ref, append. OWRT B-010-NC(4), 14-01-0001-1934.

Descriptors: *North Carolina, *Land-use, Forests, *Land classification, Watersheds(Basins), *Aerial photography, Remote sensing, Pine trees, Evaluation, *Watershed management, Forecasting, Projections.

Identifiers: *Dial Creek watershed(NC), Land use changes.

Land-use changes on a 3,384 acre watershed in northeastern Durham County were measured over the period 1940 to 1970 with the use of aerial photographs. Seven land-use categories were recognized and land-use activity was determined by observing 607 permanent sample points over the thirty year period. The purpose was to identify the land-use classes most likely to change over time and to determine the causal factors involved. Joint and conditional probability transition matrices were used to show land-use change and total land-use activity over the thirty year period. For all land-use classes total change was found to be much greater than net change. This indicates considerable within class and between class activity over the period. Between the three forest landuse classes recognized, significant reduction in the Pine Forest Type and substantial increase in Hardwood Type was observed. Since pine is generally more valuable than the hardwood found in the area, the conversion from pine to hardwood, accelerated by poor logging practices, is considered deterimental to the forest conditions of the area. To prevent further reduction in Pine Forest Type on the Watershed, the feasibility of natural Virginia pine stands was analyzed. (Howells-North Carolina) W75-05446

CHEMICAL PROPERTIES AND PARTICLE-SIZE DISTRIBUTION OF 39 SURFACE-MINE SPOILS IN SOUTHERN WEST VIRGINIA, Forest Service (USDA), Princeton, W. Va. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 5A. W75-05492

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Group 4D—Watershed Protection

FACTORS AFFECTING THE ESTABLISHMENT OF DIRECT-SEEDED PINE ON SURFACE-MINE SPOILS,
Forest Service (USDA), Princeton, W. Va.

Northeastern Forest Experiment Station. W. T. Plass.

Research Paper NE-290, 1974. 5 p, 4 fig, 4 tab, 6

Descriptors: *Strip mines, *Appalachian Mountain region, *Soil texture, *Soil chemical properties, Pine trees, Growth rates.

In a greenhouse study the emergence, survival, and growth of seven species of pine were related to chemical and textural characteristics of twelve Kentucky surface-mine spoils. The results identify three factors that may affect the establishment of direct-seeded pine on surface-mine spoils. (1) Fine-textured spoil material may restrict seedling emergence while coarse-textured sandstones and hard shales may provide a better seedbed. (2) Species vary in their response to chemical and physical characteristics of the spoil material. Loblolly and longleaf pine were adapted to a wide range of spoils. Growth of shortleaf and white pine was reduced on extremely acid spoils. (3) Growth of loblolly pine was directly related to the amount of phosphorus in the whole plant. (Curtis-Forest Ser-W75-05493

LIME RETENTION IN ANTHRACITE COAL-

BREAKER REFUSE, Forest Service (USDA), Kingston, Pa. Northeastern Forest Experiment Station.

M. M. Czapowskyj, and E. A. Sowa. Research Note NE-154, 1973. 4 p, 2 fig, 1 tab, 2

Descriptors: *Mine wastes, *Lime, *Appalachian Mountain region, *Vegetation establishment, Acidic soils.

Liming will minimize the acidity of anthracite coal-breaker refuse but it is not known for how long such treatment is effective. Lime applied to coal-breaker refuse at rates of 2.5 and 5.0 tons per acre raised the pH to neutral range, and this range was still in evidence 7 years after treatment. The pH readings decreased with the depth of the refuse profile, and below 9 inches they approximated those of the control plots. The 2.5 ton rate was almost as effective as the 5.0 ton treatment. Liming coal-breaker refuse is a practical treatment for establishing vegetation. (Forest Service) W75-05496

EROSION OVER TIME ON SEVERELY DISTURBED GRANITIC SOILS: A MODEL, Forest Service (USDA), Boise, Idaho. Intermountain Forest and Range Experiment Station.

W. F. Megahan. Research Paper INT-156, September 1974. 14 p, 6

Descriptors: *Erosion control, *Sheet erosion, Roadbanks, Equations, *Accelerated erosion, *Soil erosion, Rainfall intensity, Soil stabilization, Soil compaction, Particle size, Soil texture, *Model studies, Idaho.

Identifiers: Surface erosion, Erosion pavement, *Armoring, Granitic bedrock, Soil disturbance, Time trends, Erodibility index, Rainfall energy, *Idaho Batholith

A negative exponential equation containing three parameters was derived to describe time trends in surface erosion on severely disturbed soils. Data from four different studies of surface erosion on roads constructed from the granitic materials found in the Idaho Batholith were used to develop equation parameters. Surface 'armoring' was the dominant factor causing the time trends in surface erosion. The significance of time trends in surface erosion is discussed. (Forest Service) W75-05499 TOXICITY OF ACID COAL-MINE SPOIL TO

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 5C. W75-05591

GENETIC VARIABILITY IN SURVIVAL AND GROWTH OF VIRGINIA PINE PLANTED ON ACID SURFACE-MINE SPOIL,

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.

In: Ecology and Reclamation of Devastated Land. Vol. 1. R. J. Hutnik, and G. Davis, (editors). Gordon and Breach, New York, p 493-507, 1973. 4 fig,

Descriptors: *Strip mines, *Appalachian Mountain region, *Plant breeding, *Pine trees, Vegetation establishment, Growth rates, Genetics.

The success of pine seedlings planted on toxic spoils may depend on the physiologic efficiency of in coping with adverse site conditions. Field and greenhouse studies show that some Virginia pine progeny are definitely superior for planting on toxic spoil. Differences in growth and survival were related to the stand from which the seed for each progeny were collected. Those greenhouse grown progeny with foliar nutrient levels of .20% Ca or more and 15 ppm B or more may make above-average growth in the field. These findings may lead to a breeding program to produce genotypes specifically adapted to adverse sites and result in substantial improvement in revegetation success. (Vogel-Forest Service) W75-05594

COMPARISON OF FALL AND SPRING PLANT-ING IN STRIP-MINE SPOILS IN THE BITU-MINOUS REGION OF PENNSYLVANIA, Forest Service (USDA), Berea, Ky. Northeastern

Forest Experiment Station. G. Davis.

In: Ecology and Reclamation of Devastated Land. Vol. 1. R. J. Hutnik, and G. Davis, (editors). Gordon and Breach, New York, p 525-538, 1973. 6 tab,

Descriptors: *Strip mines, *Appalachian Mountain region, *Trees, *Shrubs, *Seasonal, Grading, Acidic soils, *Pennsylvania.

To test the possibility of planting trees and shrubs throughout both the spring and fall seasons, plantings of 10 coniferous tree species and 5 hardwood shrub species were made on 7 graded strip-mine spoils. Spring planting of trees and shrubs was more successful on the more acid sites, but shrubs survived well with fall planting on the shrubs survived well with fair pianuing on the better sites. Season of planting had no significant effect on fifth-year height of either trees or shrubs. Spring and fall planting of trees and shrubs is feasible on favorable spoil sites and the good per-formance of shrubs indicates that their wider use is warranted, especially where wildlife plantings are desired. (Vogel-Forest Service) W75-05595

FERTILIZER AND HERBACEOUS COVER IN-FLUENCE ESTABLISHMENT OF DIRECT-SEEDED BLACK LOCUST ON COAL-MINE

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.

W. G. Vogel, and W. A. Berg. In: Ecology and Reclamation of Devastated Land. Vol. 2. R. J. Hutnik, and G. Davis, (editors). Gordon and Breach, New York, p 189-198, 1973. 3 tab,

Descriptors: *Strip mines, *Appalachian mountain region, *Black locust trees, *Fertilization, Vegetation establishment, Phosphorus.

Obtaining adequate stocking of black locust direct seeded with mixtures of herbaceous species has previously been uncertain. Phosphorus fertilization at the rate of 49 kilograms per hectare appears adequate for establishing seeded black locust on most spoils. Greater success with the black locust can be achieved with slower developing herbaceous species or species that grow in late spring and summer. Fertilization enhances the establishment of quick cover along with the long-term tree cover. (Forest Service) W75-05596

PERFORMANCE OF RED PINE JAPANESE LARCH PLANTED ANTHRACITE COAL-BREAKER REFUSE, AND Forest Service (USDA), Kingston, Pa. Northeastern Forest Experiment Station. M. M. Czapowskyj.

In: Ecology and Reclamation of Devastated Land. Vol. 2. R. J. Hutnik and G. Davis, (editors). Gordon and Breach, New York, p 237-245, 1973. 5 tab,

Descriptors: *Mine wastes, *Pine trees, *Acidic soils, Mulching, Fertilizers, Lime, Appalachian Mountain region.

Anthracite coal-mine spoils create a severe en-vironmental problem and, as a rule, neither natural vegetation nor planted trees or shrubs have survived on these spoils. This study shows that lime is the most essential amendment in the establishment the most essential amendment in the establishment of red pine and Japanese larch. Commercial fertil-izer had only a slight effect on growth and no ef-fect on survival. The surface of the limed plots was still in the neutral pH range after 4 years. (Vogel-Forest Service) W75-05597

MICRO-TOPOGRAPHIC PROFILE GAGE, Forest Service (USDA), Berea, Ky. Northeastern For primary bibliographic entry see Field 7B. W75-05599

VEGETATING STRIP-MINE SPOILS FOR RU-NOFF AND EROSION CONTROL, Forest Service (USDA), Berea, Ky. Northeastern

Forest Experiment Station.

In: Proceedings Revegetation and Economic Use of Surface-Mined Land and Mine Refuse Symposium. December 2-4, 1971. Pipestem State Park, West Virginia, p 40-41, (1971). 6 ref.

Descriptors: *Strip mines, *Appalachian Mountain region, *Erosion control, *Runoff, *Vegetation establishment, Slope stability.

Excessive runoff and erosion are considered among the most important adverse effects of surface mining. If erosion is not prevented, continual exposure of fresh, relatively unweathered spoil will prolong acid and soluble salt production. An adequate cover of vegetation that is quickly established can be effective in runoff and erosion control. (Forest Service) W75-05603

WATERSHED VALUES IMPORTANT IN LAND USE PLANNING ON SOUTHERN FORESTS, Forest Service (USDA), Franklin, N.C. Coweeta Hyrologic Lab. J. E. Douglass.

Journal of Forestry, Vol 72, No 10, p 617-621, October 1974. 2 fig, 1 tab, 25 ref.

Descriptors: Water resources, *Planning, *Water quality, Water pollution, *Water supply, Water yield, *Watershed protection, *Soil erosion, Impaired water quality, Mineral content, Oxygen content, *Southeast U.S., *Land use, Forests, Exerct exists.

Identification Of Pollutants—Group 5A

Forests cover 20 to 65 percent of the land in the major water resource regions of the South, and forest management practices control or regulate the volume and timing of streamflow from these lands. Although water quality is emerging as the major water problem, quantity and timing of streamflow are also important and interrelated watershed values which should be considered in land use planning. Protection or improvement of hydrologic performance of forest soils will continue to be an important consideration in planning. (Forest Service)
W75-05716

SALTY BARK AS A SOIL AMENDMENT, Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station. For primary bibliographic entry see Field 2G.

RIVER FLOW INCREASES IN CENTRAL NEW ENGLAND AFTER THE HURRICANE OF 1938, Forest Service (USDA), Parsons, W. Va. Timber and Watershed Lab. For primary bibliographic entry see Field 2E. W75-05720

RUNOFF WATER QUALITY OF THREE TUC-SON WATERSHEDS.

Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4C.
W75-05768

PROCEDURES FOR DEVELOPING A MODEL FOR PLANNING WATERBASED LINEAR PARKS ALONG STREAM CHANNELS IN SEMIARID URBAN REGIONS, Arizona Univ., Tucson. Dept. of Watershed Management.

For primary bibliographic entry see Field 6B. W75-05769

A DECISION-AIDING MODEL FOR PLANNING OPTIMAL RESOURCE ALLOCATION OF WATER BASINS, Arizona Univ., Tucson. Dept. of Watershed

For primary bibliographic entry see Field 6A. W75-05770

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

RESPONSE THE RESPONSE OF NEARSHORE PERIPHYTON IN WESTERN LAKE SUPERIOR TO THERMAL ADDITIONS, Minnesota Univ., Minneapolis. School of Public

For primary bibliographic entry see Field 5C. W75-05354

ENVIRONMENTAL EFFECTS OF A TRITIUM GAS RELEASE FROM THE SAVANNAH RIVER PLANT ON MAY 2, 1974, Du Pont deNemours (E.I.) and Co., Aiken, S.C.

Savannah River Lab. For primary bibliographic entry see Field 5C. W75-05361

ENVIRONMENTAL SURVEILLANCE AT LOS ALAMOS DURING 1973, Los Alamos Scientific Lab., N.M. Available from the National Technical Informa-

tion Service, Springfield, Va. 22161, as REPT. No.

LA-5586, \$5.45 in paper copy, \$2.25 in microfiche. Report LA-5586, May 1974. 57 p, 14 fig, 31 tab, 11 ref. (Compiled by K. J. Schiager, and K. E. Apt.)

Descriptors: *Radioactivity, *Monitoring, Environment, *Air pollution, *Water pollution Soil contamination, *Nuclear wastes, Effluents, Ecology, Ecosystems, Titium, Bioindicators, Soils, Physical properties, Chemical properties, Meteorology, Climatology, Hydrogeology, Rainfall Disposition, *New Mexico.

Identifiers: Dosimetry, Surveillance program, *Los Alamos (NM) *Los Alamos(NM).

The CY 73 environmental monitoring program of the Los Alamos Scientific Laboratory (LASL) is described. Data are presented for concentrations of radioactivity measured in air, ground and surface waters, liquid effluents, sediments, and soils and are compared with those of AEC guides and/or data from other reporting periods. Levels of external penetrating radiation measured in LASL environs are given. The average whole body radiation dose to residents of Los Alamos County resulting from LASL operations was calculated. Chemical and biological qualities of liquid effluents and surface and ground waters of LASL environs were determined, and are compared to applicable standards. Results of related environmental studies are compared to applicable stan-dards. Results of related environmental studies are presented. Ecological investigations include (a) an environmental inventory of LASL and environs, (b) the honeybee as a potential tritium indicator organism, (c) radionuclides in Los Alamos area canyon ecosystems, and (d) physical and chemical characterizations of Los Alamos area soils. Results are given of meteorological investigations of Los Alamos climatological records, rainfall distributions, and windfield patterns. There are also data pertaining to the geo-hydrological determination of flood frequencies and maximum discharges of Los Alamos area canyons. (Houser-ORNL) W75-05362

COMPATIBILITY OF HAFNALLOYS 105 AND 150 WITH 238PUO2,

Los Alamos Scientific Lab., N.M. C. C. Land, and D. E. Peterson.

Available from the National Technical Inform tion Service, Springfield, Va. 22161, as REPT No. LA-5593, \$4.00 in paper copy, \$2.25 in microfiche. Report LA-5593, August 1974. 8 p, 14 fig, 1 tab, 6

Descriptors: *Thermodynamic behavior, Research and development, *Storage tanks, *Hafnium, *Plutonium, *Oxides, *Compatibility, Fuels, Temperature, Duration, Diffusion, Metals.

The compatibility between two Hafnalloys (hafnium-platinum-palladium formulations) and 238PuO2 (plutonia) was investigated after their exposure at 1000 degrees C for 2000 and 5800 h. Hafnalloy samples with and without preapplied surface layers of hafnia were studied. To interpret the oxidation behavior of the two alloys, thermodynamic and diffusion calculations of their reactivities with plutonia were correlated with present the property of the correlated with plutonia were correlated with present the correlated with the cor reactivites with plutonia were correlated with ex-perimental ebservations. The two Hafnalloys proved to be unsuitable materials for plutonia storage at 1000 degree C for 2000 hours or longer, because oxygen and plutonium diffuse into the alloy lattice and the container becomes brittle. Calculations indicate that they also would not make suitable containers for plutonia at 800 degrees C. (Houser-ORNL) W75-05363

DEVELOPMENT OF AIR-SAMPLING TECHNIQUES, PROGRESS REPORT, OCTOBER 1, 1973, THROUGH MARCH 31, 1974, Los Alamos Scientific Lab., N.M.
E. E. Campbell, G. O. Wood, and R. G. Anderson. Available from the National Technical Information Service, Springfield, Va. 22161, as REPT. No.

LA-5634-PR, \$4.00 in paper copy, \$2.25 in microfiche. Report LA-5634-PR, June 1974. 8 p, 10

Descriptors: Research and development, *Air pol-lution, *Sampling, *Analytical techniques, *Adsorption, *Colorimetry, *Chromatography, Amino acids, Sorption, Design criteria, Evalua-tion, Technology, *Pollutant identification, Gas chromatography chromatography. Identifiers: Formaldehyde, Amines, Sorbents.

Thermal desorption-gas chromatographic analysis of formaldehyde collected on alumina has been abandoned in favor of a colorimetric method. This modified chromotopic acid method has been found to have much greater sensitivity and specificity and acceptable precision and accuracy. Capacity and breakthrough measurements have been made for a selected alumina sorbent by sampling air containing formaldehyde. As a result, a sampling tube has been designed capable of sampling for up to 1600 s (27 min) under extreme humidity condi-Additional breakthrough measurements have been done for anilane, o-toluidine, and xylidine in a high-humidity atmosphere sampled with 45/60-mesh silica gel. From these results a new sampling tube has been designed for sampling aromatic amines. The precision of the total sampling and analysis method has been determined. The accuracy of the method was also confirmed by comparison with an independent sampling and analysis procedure. (Houser-ORNL) W75-05365

BIBLIOGRAPHY OF PUBLISHED PAPERS OF THE ATOMIC BOMB CASUALTY COMMIS-

Atomic Bomb Casualty Commission, Hiroshima (Japan); and Atomic Bomb Casualty Commission, Nagasaki (Japan).
For primary bibliographic entry see Field 5C.
W75-05366

BIBLIOGRAPHY ON PUBLISHED PAPERS OF THE ATOMIC BOMB CASUALTY COMMIS-

Atomic Bomb Casualty Commission, Hiroshima (Japan); and Atomic Bobm Casualty Commission, Nagasaki (Japan). For primary bibliographic entry see Field 5C. W75-05367

FEASIBILITY STUDIES OF THE PARTITION-ING OF COMMERCIAL HIGH-LEVEL WASTES GENERATED IN SPENT NUCLEAR FUEL REPROCESSING: ANNUAL PROGRESS RE-

PORT FOR FY-1974,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D. W75-05368

ASSESSING AND CONTROLLING HAZARD FROM TRITIATED WATER. CONTROLLING Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs. For primary bibliographic entry see Field 5G. W75-05369

RADIATION DATA: SECTION II. WATER. Office of Radiation Programs, Washington, D.C. Available from sup Doc, U.S. Gov. Print Office, Wash, D.C. as REPT. No. RDDRA4,15(9) 1974. Radiation Data and Reports, Vol 15, No 9, p 587-591, September 1974. 2 fig, 1 tab, 4 ref.

Descriptors: *Monitoring, *Radioactivity, *Environment, *Sampling, Water, Water pollu-tion, Fallout, Governments, Administrative agen-cies, Analytical techniques, Radioisotopes, Triti-

Identifiers: *Surveillance program.

Group 5A—Identification Of Pollutants

Data provided by Federal, state, and foreign governmental agencies and other cooperating or-ganizations are presented. Data is accumulated from surveillance programs concerning from surveillance programs concerning radionuclide concentrations of surface, ground, and treated water. Most of the analytical determinations are for gross beta and gross alpha radioactivity. These values are compared with the Public Health Service Drinking Water Standards. (Houser-ORNL) W75-05374

ENVIRONMENTAL LEVELS OF RADIOAC-

ENVIRONMENTAL LEVELS OF RADIOAC-TIVITY AT ATOMIC ENERGY COMMISSION ISTALLATION, Office of Radiation Programs, Washington, D.C. Available from Sup Doc, U.S. Gov. Print. Office as REPT No. RDDRA4,15(9), 1974. Radiation Data and Reports, Vol 15, No 9, p 609-624, Sep-tember 1974. 6 fig, 7 tab, 4 ref.

Descriptors: *Monitoring, *Assay, *Assessment, *Radioactivity, *Sites, Nuclear powerplants, Nuclear energy, Facilities, Administrative agen-cies, Water, Sediment, Uranium, Thorium, Radium, Standards, Regulation, Strontium, Cesium, Atlantic Ocean, Public health. Identifiers: *Surveillance program, Mohawk

River, Farmington River.

The U.S. Atomic Commission (AEC) receives from its contractors annual reports on the levels of environmental contaminants including radioactivi-ty in the vicinity of major Commission installations. The reports include data from routine monitoring programs where operations are of such a nature that plant environmental surveys are required. The summaries of the environmental radioactivity data are presented for Feed Materials Production Center and Knolls Atomic Power Laboratory. (Houser-ORNL) W75-05375

RADIATION DATA. SECTION II. WATER Office of Radiation Programs, Washington, D.C. Available from Sup Doc, U.S. Gov. Print. Office, Wash. D.C. as REPT No. RDDRA4-15(10) (1974). In: Radiation Data and Reports, Vol 15, No 10, p 667-671, October 1974. 6 fig. 2 tab, 4 ref.

Descriptors: *Monitoring, *Environment, *Water, *Water pollution, *Radioactivity, Assessment, Assay, Data collections, Governments, Sampling, Analytical techniques, Publications, Domestic water, Public health, Potable water, *Washington. Domestic Identifiers: Surveillance Program.

The Environmental Protection Agency and other Federal, State, and local agencies operate extensive water quality sampling and analysis programs for surface, ground, and treated water. Most of these programs include determinations of gross beta and gross alpha radioactivity and specific radionuclides. Although the determination of the total radionulcide intake from all sources is of primary importance, a measure of the public health importance of radioactivity levels in water can be obtained by comparison of the observed values with the Public Health Service Drinking Water Standards. Surveillance data from a number of Federal and State programs are published periodically to show current and long-range trends. Radioactivity in Washington surface water, July 1971. June 1972 in reported. (Houser-ORNL) W75-05377

RADIATION DATA. SECTION IV. OTHER DATA. ENVIRONMENTAL LEVELS OF RADIOACTIVITY AT ATOMIC ENERGY COMMISSION INSTALLATIONS,

Goodyear Atomic Corp., Piketon, Ohio. Available from Sup Doc, U.S. Gov. Print. Office, Wash. D.C. as REPT No. RDDRA4-15(10) (1974). 3 fig. 5 tab. 2 ref.

Descriptors: *Monitoring, *Nuclear energy, *Nuclear powerplants, *Uranium, *Effluents, *Water pollution sources, Water pollution, Radioactivity, Ohio River, Regulation, Governments, Water quality standards.

Described are the monitoring programs for the Portsmouth area gaseous diffusion plant and the Shippingport Atomic Power Station for the calender year 1972. Discussed are the various environmental standards applicable to the plants; the sampling, monitoring, and analytical procedures; and the extent of conformance with the standards. Liquid effluents from the Shippingport plant are collected, processed, sampled, and analyzed to en-sure conformance with the applicable water quality standards prior to release to the environment. Liquid effluents containing radioactivity are processed to reduce the amount of radioactivity to processed to reduce the amount of radioactivity to the lowest practical level. Water containing radioactivity is generated primarily from draining the reactor collant system and decontaminating equipment. The plant is equipped with systems to collect and process this water and remove most of the radioactivity before it is released to the Ohio River. (Houser-ORNL)

CONTAMINATION LIMITS FOR REAL AND PERSONAL PROPERTY, PROGRESS REPORT, JULY-DECEMBER 1973, Los Alamos Scientific Lab., N. Mex.

J. W. Healy, and W. J. Smith. Available from NTIS, Springfield, Va. as Rept. No LA-5579-PR, \$4.00 in paper copy, \$2.25 in microfiche. Report LA-5579-PR, April 1974. 6 p, 3

Descriptors: *Plutonium, *Soil contamination, *Transfer, *Kinetics, *Absorption, *Path of pollutants, Movement, Measurement, Model studies, Soils, Particle size, Meteorology, Public health, Air pollution, Water pollution. Identifiers: Dose, Internal dose, External dose.

Work performed from July to December-1973 along with some needed programs to obtain additional data are described. A brief description of the preliminary standard for plutonium in soils along with progress on a calculation of the FIDLER calibration and a conceptual model for contamination transfer from an object to the body are included. (Houser-ORNL) W75-05379

ANNUAL REPORT ON PROJECT ANOIISA, FISCAL YEAR 1974, Argonne National Lab., Ill.

For primary bibliographic entry see Field 5B. W75-05382

MINERALOGY AND ION EXCHANGE CHARACTERISTICS OF SAVANNAH RIVER PLANT STREAMBED SEDIMENTS,

Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab. For primary bibliographic entry see Field 5B. W75-05389

DESCRIPTION OF A NEW WASTE WATER ANALYZER FOR LABORATORIES (RESPIROMETER) (IN HUNGARIAN),

Hidrologiai Kozlony, No 5, p 217-221, 1974. 5 fig,

Descriptors: *Analytical techniques, *Water purification, *Laboratory equipment, Waste water, Biochemical oxygen demand, Sludge, *Pollutant identification. Identifiers: *Respirometer, Hungary.

New batch type and flow-through respirometers were developed in Hungary for complex laborato-

ry analysis of waste waters and activated sludge regarding the parameters which determine the biological purification of waste waters. An oxygen supply is automatically controlled by oxygen dis-placement from a burette which permits visual checkup and also automatic recording of the oxygen consumption in both the batch type and flow-through respirometers. The batch type respiromethrough respirometers. The batch type respirome-ter is suitable for the determination of the complete BOD curve, the rate of carbon dioxide formation, the sludge growth, and, by means of two respirometers, the total biochemical oxygen consumption, including that for endogenous respiration. The flow-through respirometer with a peristaltic pump for water supply and discharge at preset rates is suitable for the determination of: the rate of oxygen consumption of the mixture of waste water and activated sludge; the specific ox-ygen demand; the specific endogenous and sub-strate respiration; the specific sludge formation; the waste water toxicity; and, the total BOD. (Takacs-FIRL) W75-05398

MICROBIOLOGY OF WATER, (LITERATURE

REVIEW), Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab. For primary bibliographic entry see Field 5B. W75-05400

TRACE METAL ASSOCIATIONS IN SUB-ARC-TIC FJORD ENVIRONMENTS, PROGRESS RE-PORT MAY 1972-MARCH 1974,

Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 5B. W75-05403

EXTRACTION OF COBALT, IRON, INDIUM AND ZINC FROM SEAWATER BY MEANS OF THE TRIFLUOROACETYLACETONE

TOLUENE SYSTEM,
Alaska Univ., College. Inst. of Marine Science.
M. L. Lee, and D. C. Burrell.

Analytica Chimica Acta, Vol. 62, No 1, p 153-161, November, 1972. 8 fig, 22 ref, In: University of Alaska, Institute of Marine Science, Report No. RLO 2229-TI-27, 1974, p. 55-63.

Descriptors: *Metals, *Seawater, *Analytical techniques, *Chelation, Chemical reactions, Iron, Zinc, Cobalt, Trace elements, Gas chromatography, Chemical analysis, Water pollution, *Pollutant identification, *Separation techniques.

This extraction method was studied since g liquid chromatography, although not yet applied to seawater trace metal analysis, requires partition and detection of metals as organo-complexes, and also since chelation and extraction may be used to prepare volatile metal compounds for mass spectrometric analysis. Iron, indium, cobalt and zinc were completely and rapidly extracted in a single extraction with an equal volume of toluene-trifluoroacetylacetone (0.1M) for Fe and In, and toluene-trifluoroacetylacetone (0.1M)-isobutylamine (0.4M) for Co and Zn. A 90% extraction of indium was obtained with an aqueous/organic volume ratio of 20 and a 88.5% extraction for iron with a volume ratio of 40. There was a deviation of the iron and indium extraction curves from seawater compared with the theoretical trivalent metal curves: this was attributed to the high con-centration of halogen ions in seawater; which makes seawater a superior medium for solvent extraction. (See also W75-05403) (Pulliam-Van-W75-05404

DETERMINATION OF HEAVY METALS IN SEAWATER BY CARBON FILAMENT ATOMIC

SPECTROMETRY, Alaska Univ., College. Inst. of Marine Science. D. C. Burrell.

Identification Of Pollutants—Group 5A

In: University of Alaska, Presented at National Fall Meeting, American Geophysical Union, San Francisco, December, 1972. 7 p, 12 fig, Institute of Marine Science, Report RLO-2229-TI-27, p 88-106.

Descriptors: "Heavy metals, "Sea water,
"Spectrophotometry, "Analytical techniques,
"Trace elements, Water pollution, Pollutants,
Chemical analysis, Testing procedures, "Pollutant
identification.
Identifiers: "Flameless photometry.

The superior cell characteristics of discrete, flameless atomic adsorption atomization provide a detection limit capability for the direct determination of many trace heavy metals in natural waters without preanalysis concentration. This work was concerned with the use of carbon filament cells operated in the mini-Massman mode for the determination of soluble cadmium, copper, lead and silver in marine water. Sequential atomization of raw seawater yielded non-reproducible results and solvent extraction separation of analyte and matrix metals has been adopted. Filament atomization enables the extraction step to be optimized with regard to phase volumes and choice of organic ligand and solvent. (See also W75-05403) (Pulliam-Vanderbilt)

DIRECT PHOTOMETRIC DETERMINATION OF SOLUBLE PROTEINS IN NATURAL WATERS, (IN RUSSIAN), Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.

Akademya Nauk UKSK, Kiev. Instytut Hidrobiologii. For primary bibliographic entry see Field 2K. W75-05409

MEASUREMENTS OF MERCURY SORPTION

Naval Research Lab., Washington, D.C. Ocean Sciences Div.

P. J. Hannan, P. E. Wilkniss, C. Patouillet, and R. A. Carr.

Available from the National Technical Information Sep 31, 11pringfield, Va. 22161 as AD-774 694, \$3.75 in paper copy, \$2.25 in microfiche. NRL Report 7628, December, 1973. p 31, 11 tab, 7 fig, 33 ref. NRL Problem G04-01.

Descriptors: *Mercury, *Algae, *Sorption, Aquatic life, Laboratory tests, Radioisotopes, Tracers, Analytical techniques, Fluorescence, Absorption, *Pollutant identification, Measurement.

The results of laboratory experiments concerning mercury sorption by two marine algae, Phaeodactylum tricornutum and Chaetoceros galvestonensis were described. Measurements of mercury uptake were made with the use of isotopes (carrierfree Hg-197, and Hg-203 incorporated in mg mercury/liter concentrations). Significant mercury concentrations were found in cells grown in media prepared from chemically pure reagents; concentrations of 14 to 116 mg/kg were present in cells arvested from 10% and 100% concentrations of culture medium. Phaeodactylum cells grown in a 10% culture medium in the presence of 0.05 mg mercury/liter contained 2400 mg mercury/kg but their growth was inhibited only 55% in a 4-day period. Chaetoceros cells had a greater affinity for mercury and containing 0.10 mg mercury/kg when cultured for the same time period in a 25% culture medium containing 0.10 mg mercury/kg when cultured for the same time period in a 25% culture medium containing 0.10 mg mercury/kg when cultured for the same time period in a 25% culture medium containing 0.10 mg mercury/kg when cultured for the same time period in a 25% culture medium containing 0.10 mg mercury/kg when cultured for the same time period in a 25% culture medium containing 0.10 mg mercury/kg when cultured for the same time period in a 25% culture medium tontaining oli mg mercury/kg when cultured for the same time period in a 25% culture medium containing oli mg mercury/kg when cultured for the same time period in a 25% culture medium containing oli mg mercury/kg when cultured for the same time period in a 25% culture medium containing oli mg mercury/kg when cultured for the same time period in a 25% culture medium containing oli mg mercury/kg when cultured for the same time period in a 25% culture medium containing oli mg mercury/kg when cultured for the same time period on the following mg mercury/kg but their following mg mg

THE RELATION BETWEEN PRIMARY PRODUCTIVITY, NUTRIENTS, AND THE TROUT ENVIRONMENT IN SOME NEW ZEALAND LAKES,

Marine Dept., Wellington (New Zealand). Fish Research Div.

For primary bibliographic entry see Field 5C. W75-05419

A NEW TECHNIQUE FOR REMOTE MONITORING OF FRESHWATER INVERTEBRATE POPULATIONS,

Minnesota Univ., Duluth. Lake Superior Basin Studies Center.

W. R. Swain, R. S. Pozos, R. M. Wilson, and R. P. Neri.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 228, \$3.25 in paper copy, \$2.25 in microfiche. (1974). 10 p. 4 fig. 20 ref. OWRT B-097-MINN(1), 14-31-0001-4097.

Descriptors: *Remote sensing, Freshwater, *Invertebrates, *Plankton, Monitoring, *Vertical migration, Instrumentation, Measurement, *Pollutant identification.

Identifiers: Thermistor probes.

The use of thermistor probes for remote non-invasive monitoring of the vertical movement of freshwater invertebrate populations was demonstrated. The system consisted of a rectangular column constructed of plexiglass. A bipolar arrangement of stainless steel and electrodes (20 mesh/inch; 0.023 guage wire, type 304) were cemented on opposing walls in series 10 cm apart. These electrodes were then connected by shielded cable to a Brush Impedance Coupler (model 11-4307-06) which utilized an excitation frequency of 50 KHz and maximum excitation current of 1.5 milliamperes. The signal output from the impedance converter was then amplified and monitored on Brush 440 multichannel recorders, a cathode ray oscilloscope, and a 3 watt audio monitoring system. The system has been used to monitor individual species for twenty days at a time with excellent results. (Walton-Minnesota)

CADMIUM AND ZINC BINDING IN MAM-MALIAN LIVER AND KIDNEYS.

MALIAN LIVER AND KIDNEYS,
Dalhousie Univ. Halifax, (Nova Scotia). Dept. of
Biochemistry.

Archives of Environmental Health, Vol 24, No 6, p 419-425, June, 1972, 1 tab, 5 fig, 20 ref. MR-1544, MA-4526.

Descriptors: *Cadmium, *Zinc, *Mammals, *Proteins, Human pathology, Public health, Laboratory tests, Laboratory animals, Rodents, Testing procedures, Analytical techniques, Adsorption. *Pollutant identification.

Rats and mice were injected subcutaneously with cadmium chloride Cd109 and zinc chloride Zn65. Both isotopes concentrated primarily in liver and kidneys. Tissue subcellular fractionation showed 70 to 80% Cd109 and Zn65 associated with cytoplasmic soluble fraction. Soluble fraction gel filtration revealed most Cd109 was bound to proteins of 11,000 to 12,000 molecular weight; Zn65 was associated mainly with larger sized molecules. In rats, two weeks following isotope dose, depletion of Zn65 from cytoplasmic macromolecules was demonstrated; Cd109 remained fixed to cadmium-binding proteins (Cd-BP). By cion-exchange chromatography, Cd-BP) was resolved into major components. Similar components were separated from human kidney Cd-BP. Presence of Cd-BP was noted in humans and monkey liver tissues. It is suggested that mamalian organism intracellular Cd-BP apparently acts as biochemical mechanism for sequestration of toxic Cd2+ ions. (Jernigan-Vanderbilt)

FLAMELESS ATOMIC ABSORPTION DETERMINATION OF COBALT NICKEL, AND COPPER - A COMPARISON OF TANTALUM AND MOLYBDENUM EVAPORATION SURFACES,

Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.

Analytical Chemistry, Vol 46, No 13, p 1983-1987, November, 1974, 8 fig, 3 tab, 15 ref.

Descriptors: *Spectrophotometry, *Cobalt, *Nickel, *Copper, *Analytical techniques, Chemical analysis, Trace elements, Heavy metals, Testing procedures, *Pollutant identification.

Identifiers: *Atomic absorption spectroscopy.

Molybdenum and tantalum evaporation filaments were investigated for their suitability in determining nanogram quantities of Co, Ni, and Cu by flameless A.A.S. Tantalum filament surfaces interacted with these elements during evaporation making the determination of Co and Ni very difficult and lowering the precision of the Cu determination. Molybdenum filaments showed no sign of interaction with these elements and gave very reproducible results with high absolute sensitivities (5-30 pg). The presence of any oxide or nitride on the evaporation surface produced marked interelemental interference effects. However, when very clean filaments were used, interference effects were significantly lower than those observed for graphite surfaces. An increase in filament temperature resulted in reduced interelemental interference and improved precision. The effects of the presence of various foreign ions were also investigated. Throughout the work, particularly strong cross interferences occurred between iron, cobalt, nickel, and chromium. (Pulliam-Van-derbilt) W75-05487

SOLVENT EXTRACTION FOR USE WITH FLAME ATOMIC ABSORPTION SPECTROMETRY,

Tromoto Univ., (Ontario). Dept. of Geology. Analytical Chemistry, Vol 46, No 13, p 1894-1898, November, 1974, 3 fig, 5 tab, 8 ref.

Descriptors: *Chelation, *Spectrophotometry, *Analytical techniques, *Heavy metals, *Solvent extractions, Cadmium, Cobalt, Copper, Iron, Lead, Nickel, Zinc, Testing procedures, Trace elements, *Pollutant identification. Identifiers: *Atomic absorption spectrometry.

A method for concentrating metals from natural waters prior to flame A.A. analysis was described. By using two chelating agents, ammonium pyrolidindithiocarbamate (APDC) and diethylammonium diethyldithiocarbamate (DDDC), a total of eight metals were simultaneously extracted-cadmium, cobalt, copper, iron, lead, nickel, silver, and zinc. All of the metal complexes formed were stable for nearly 9 hours. In the study, F, Ca, K, Mg, Na, phosphate, silicate, and biodegradable detergent at 50- and 100-ppm were tested for interference. Only the detergent appeared to affect the metal to any degree. The method also showed high sensitivity and good precision - generally less than 5% coefficient of variation on a routine basis. Accuracy was tested using EPA water standards and was found to be good. The application of this method to mercury, chromium (III), and manganese was also considered. (Pulliam-Vanderbilt) W75-05488

COMPARISON OF CONTINUOUS WAVE AND PULSED CONTINUUM SOURCES FOR ATOMIC FLUORESCENCE FLAME SPEC-TROMETRY

TROMETRY, Florida Univ., Gainesville. Dept. of Chemistry. Analytical Chemistry, Vol 46, No 13, p 1898-1902, November, 1974, 6 fig, 3 tab, 23 ref.

Group 5A-Identification Of Pollutants

Descriptors: *Spectrophotometry, *Fluorescence, Analytical techniques, Metals, Testing procedures, *Flame photometry, Laboratory tests, *Pollutant identification.

The study involved the application of pulsed xenon lamp as well as a point source continuous wave (cw) source xenon arc lamp with a special mirror system enabling the transfer of nearly all the radiation produced by the source into the flame atomizer. With the pulsed lamp, either an analog or digital boxcar detector was used, whereas with the cw source either a lock-in amplifier or a synchronous photon counter was used. Both sources were used with a large solid angle collection efficiency. Both the sources and the detection systems were compared. It was reported the digital detection system had little advantage over the analog one. The detection limits obtained for all elements studied with the pulsed source were poorer than with the cw source. It was found the cw source gave a larger signal-to-noise ratio, which was possibly due to the useable source flux (at the atomizer) ratio determined largely by solid angle considerations. The overall convenience of the cw source with either detection system and the detection limits found for 13 elements indicated to the analysts that the cw source has practical value in AFS. (Pulliam-Vanderbilt) W75-05489

CHEMICAL PROPERTIES AND PARTICLE-SIZE DISTRIBUTION OF 39 SURFACE-MINE SPOILS IN SOUTHERN WEST VIRGINIA, Forest Service (USDA), Princeton, Northeastern Forest Experiment Station. W. T. Plass, and W. G. Vogel. Research Paper NE-276, 1973. 8 p, 3 fig, 6 tab.

Descriptors: *Strip mines, *Appalachian Mountain region, *Particle size, *Soil chemical properties, Vegetation establishment, Fertilizers, *West Virginia, *Pollutant identification.

The chemical composition and particle-size distribution of spoil material affects establishment and growth of vegetation and water quality in areas disturbed by surface mining. The soil-size fraction of spoils analyzed averaged 37%. spoils had a median pH of 5.0 or more, low (3.1 to 7.0 parts per million) or very low (< 3.0 parts per 7.0 parts per million) of very tow (< 3.0 parts per million) P, exchangeable acidity ranging from 0.05 to 14.35 milliequivalents per 100 grams and exchangeable Al ranging from 0 to 7.25 milliequivalents per 100 grams. Yields of K-31 fescue were much lower on spoils having a pH below 5.0 even with added fertilizer while the same effect for sericea lespedeza occurred at pH 4.5. There is generally adequate soil-size material for satisfactory plant growth; however, tests show that addition of N and P fertilizer is essential for establishing vegetation. (Curtis-Forest Service) W75-05492

AVOID PROBLEM SPOILS THROUGH OVER-BURDEN ANALYSIS, Forest Service (USDA), Berea, Ky. Northeastern

Forest Experiment Station. T. L. Despard.

General Technical Report NE-10, 1974. 4 p, 1 fig, 5

Descriptors: *Strip mines, *Appalachian Mountain region, *Soil chemical properties, *Core drilling, Grading, Chemical analysis, Pollutant identification.

During strip mining of coal and subsequent grading operations, indiscriminant placement of toxic overburden strata at the spoil surface creates reclamation problems that are difficult and expensive to correct. Evaluation of overburden material before mining is suggested as a reliable means of predicting spoil quality and devising a reclamation plan. This can best be accomplished by core-drilling the proposed area and submitting the recovered core sample to a laboratory for analysis. Color, pyrite content, and pH are field guides that can be used to determine the potential toxicity of exposed overburden strata. By pre-mining tests of overburden it is possible to avoid forming toxic spoil as a result of unknowingly placing material from problem strata at the surface. (Forest Service) W75-05494

DISSOLVED ORGANIC CARBON (DOC), AN INDEX OF ORGANIC CONTAMINATION IN GROUND WATER NEAR BARSTOW, CALIFORNIA,

Geological Survey, Garden Grove, Calif. Water Resources Div.

J. L. Hughes, L. A. Eccles, and R. L. Malcolm. Ground Water, Vol 12, No 5, September-October, 1974. p 283-290. 3 fig. 1 tab, ref.

pollution Descriptors: Water effects, *Degradation(Decomposition), *(
Waste disposal, Distribution, *Groundwater, Waste disposal, Analytical techniques, Laboratory tests, Testing procedures, *California, *Biodegradation, Carbon, *Pollutant identification, Path of pollutants.
Identifiers: Barstow(Calif), Mojave River(Calif),

*Dissolved organic carbon.

The alluvial aquifer underlying and adjacent to the Mojave River near Barstow, California, has been subjected to degradation from percolation of industrial and municipal wastes for more than sixty years. Effluents discharged to the aquifer have contained high concentrations of both organic (detergents, oil and grease, phenols, humic compounds) and inorganic (chromium, chloride, phosphates) substances. The concentration of dissolved organic carbon (DOC), as determined by a wet combustion technique, has been shown to be a definitive parameter in identifying ground water affected by waste disposal. The vertical distribu-tion of DOC and other constituents indicates that two plumes of degraded water occur at different depths. A comparison of areal distribution of DOC and detergents (as MBAS) suggests that some organic compounds may have been adsorbed by the aquifer sediments. (Bradbeer-NWWA) W75-05502

HEAVY METAL CONCENTRATIONS AND DEPOSITION IN BULK PRECIPITATION IN MONTANE ECOSYSTEMS OF NEW HAMPSHIRE, Cornell Univ., Ithaca, N.Y. Dept. of Ecology and

Systematics

For primary bibliographic entry see Field 5B. W75-05509

INSTREAM AERATION AND PARAMETERS OF STREAM AND ESTUARINE NITRIFICA-TION,

Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
T. J. Tuffey, J. V. Hunter, W. Whipple, and S. L.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 183, \$4.25 in paper copy, \$2.25 in microfiche. Water Resources Research Institute, Rutgers University - The State Univ. of N.J., New Brunswick, N.J., November 1974. 59 p, 21 tab, 15 fig, 38 ref. OWRT B-027-NJ(3). 14-31-0001-3305.

*Nitrification. *Biochemical oxygen demand, *Oxygen demand, Oxygen sag, *New Jersey, Aeration, Model stu-Rivers, Measurement, Instrumentation, Estuaries, On-site investigations, Water pollution Sources, Pollutant identification.

Identifiers: *Nitrosomonas, *Nitrobacter, Warburg apparatus, *Passaic River(NJ), Artificial aeration, *Little Miami River(NJ).

The first objective was to verify a tentative hypothesis that artificial stream aeration might be found to stimulate the nitrification process. Field investigations on the Passaic River, N.J., and the Little Miami River gave a clear cut negative answer to this hypothesis. The second objective was to investigate more fully the chemical and was to investigate more than the chemical ambiochemical mechanisms of stream nitrification. It was found that the much used Warburg apparatus is relatively inaccurate in measuring BOD of streams, and inherently unsuitable for use in measurements. suring nitrification. Nitrification does occur in shallow surface-active streams and in estuaries (but through entirely different processes). The central portions of medium-sized rivers generally do not nitrify to a significant extent. Requirements for modelling such processes are discussed. W75-05530

AUTOMATED MONITORING OF RECOVERED WATER QUALITY, NASA Tech Brief No B74-10029, May, 1974. 2 p, 2

Descriptors: *Potable water, *Reclaimed water, *Monitoring, *Equipment, Testing, Water analy-*Monitoring, *Equipment, Testing, sis, Quality control, Analytical techniques, Regu-lation Maintenance. Data analysis, *Pollutant lation, Maintenance, Data analysis, identification, Waste water treatment.

A laboratory prototype water quality monitoring system is described. The system provides an automatic method for online monitoring of the chemical, physical, and bacteriological properties of recovered water and for identifying a malfunction in the water recovery system. Parameters monitored are chloride ion concentration, ammonium ion concentration, pH, specific conductance, total organic carbon, and E. coli. The system is a practical method to assess the potability of reclaimed water and utilizes commercially available sensors that can be suitably modified. The bacteriological quality of recovered water is monitored by a chemiluminescence produced by the catalytic action of bacterial porphyrins, specifically hematin, on a luminol-hydrogen peroxide mixture. An eighteen-step programmer performs most of the process control. During each step twenty functions can be controlled. Signals are sent to the processing electronics from the photo-multiplier and provide a readout to be used for permanent records and analysis of data. (Orr-FIRL) W75-05545

WATER QUALITY ANALYSIS SYSTEM WITH MULTICIRCUIT SINGLE SHELL HEAT

Beckman Instruments, Inc., Fullerton, Calif. E. A. Houser, and B. W. Schwindt.

Descriptors: *Patents, *Analytical techniques, *Instrumentation, *Water analysis, Water quality, Power plants, Flow rate, Cooling water, *Heat exchangers, Pollutant identification.

A modular water quality analysis system for steam electric power generating plants includes a novel single shell multicircuit heat exchanger that varies the rate of flow of cooling water through each of the multiple circuits. The heat exchanger has a physical construction such that it can be mounted on top of the system rack thereby replacing a plurality of individually manifolded and valved heat exchangers formerly mounted at the back of the exchangers formerly mounted at the back of the rack. The flexibility of design in the modular system also permits the same basic apparatus to be adapted to a large variety of different sizes and types of power generating plants having different analysis requirements. (Sandoski-FIRL) W75-05549

DEVELOPING WATER SAMPLING STAN-DARDS.

Environmental Science and Technology, Vol 8, No 9, p 786-787, September, 1974.

Identification Of Pollutants—Group 5A

Descriptors: Equipment, *Sampling, *Water analysis, *Quality control, Water sampling, On-site data collection, Data collection, Variability, *Water quality standards, *Pollutant identifica-

The concensus of opinion at the D-19 Symposium on Aquatic Sampling and Measurement for Water Pollution Assessment held in Washington, D.C., in June, 1974, (sponsored by the American Society for Testing and Materials), was that no standard sampling equipment or technique exists for determining how polluted a given waste water stream is. One of the most difficult sampling jobs is to obtain representative samples from storm or combined sewers. Different methods for sampling sewers include discrete samples, simple composite samples, flow-proportional composite samples, and sequential composite samples. Equipment and sampling standards are in a formation stage; standards should emphasize intake, transport, tubing and piping, sample size, flow control, power sources, and temperature control. An ideal sampler should operate on batteries weighing less than 40 pounds which are capable of reliable sampling for three days in a standard manhole with uniform atmosphere and protection from vandalism. It should have the ability to: take flow-proportional and time-composite samples; separate the sample from all metal; purge the intake; vary the intake from 2 to 10 ft/sec; multiplex; vary the collection intervals from ten minutes to four hours. The sampler should be explosion proof, have a watertight exterior case, a security lock, a 2 1/2 gallon capaci-ty, and a lift of 20 feet. (Orr-FIRL) W75-05555

TRI-UNIVERSITY REPORT ON THE STATUS
OF ENVIRONMENTAL CONTAMINATION BY
LEAD,

Missouri Univ., Rolla. For primary bibliographic entry see Field 5B.

PROBLEMS WITH MODELING TRANSPORT AND BIOLOGICAL TRANSLOCATION, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 5B. W75-05568

OVERVIEW OF A UNIFIED TRANSPORT MODEL, Union Carbide Corp., Oak Ridge, Tenn. Computer

Sciences Div. For primary bibliographic entry see Field 5B. W75-05569

A MULTI-SOURCE ATMOSPHERIC TRANS-PORT MODEL FOR DEPOSITION OF TRACE CONTAMINANTS, Union Carbide Corp., Oak Ridge, Tenn. Computer

Science Div. For primary bibliographic entry see Field 5B. W75-05570

PHYSICAL MODELING OF ATMOSPHERIC DIFFUSION, Colorado State Univ., Fort Collins. Fluid

Mechanics Program.
For primary bibliographic entry see Field 5B. W75-05571

ANALYSIS OF CADMIUM PATHS IN ZINC SMELTER OPERATIONS, Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 5B.

W75-05572

MODELING CADMIUM DISCHARGE FROM AN ELECTROPLATING LINE WITH THE GASP IV SIMULATION LANGUAGE, Purdue Univ., Lafayette, Ind. School of Industrial

Engineering. For primary bibliographic entry see Field 5B. W75-05573

PROBLEMS WITH THE USE OF CASCADE IM-

PACTORS, Maryland Univ., College Park, Dept. of Chemis-

try.
G. E. Gordon, E. S. Gladney, J. M. Ondov, T.
Conry, and W. H. Zoller.

Conry and W. H. Zoller.

In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 138-145, 2 fig, 2 tab, 5 ref.

Descriptors: *Data collections, *Air pollution, *Particle size, Analytical techniques, *Trace elements, *Sampling, Aluminum, Calcium, Manganese, Filters, *Instrumentation, Pollutant identification

The problems with the use of cascade impactors were discussed. In studies of atmospheric particles to determine size distribution of particles bearing specific elements, the particles are collected with a cascade impactor, the size fractions collected are analyzed. Considerable care must be taken in the use of cascade impactors because of experimental artifacts that can distort the size distributions, especially wall losses and particle bounce-off, the latter followed by re-entrainment and deposition of the particles on later stages of the impactor. -side comparisons were made of three types of impactors in common use in particulate studies: the Lundgren and Scientific Advances (or 'Battelle') impactors and a modified Andersen sampler. The Scientific Advances impactor gave the highest collection efficiencies and the least amount of bounce-off. The modified Andersen produced slightly more distortion and the Lundgren exhibited serious bounce-off effects, especially for particles bearing aluminum. (See also W75-05277) (Jerigan-Vanderbilt) W75-05574

INDUSTRIAL SOURCE SAMPLING FOR TRACE METALS, Purdue Univ., Lafayette, Ind.

In: Proceedings of the First Annual NSF Trace in: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-mission, Office of Information Services, Techni-cal Information Center, Oak Ridge, Tenn., March, 1974, p 146-169, 10 fig, 3 tab.

Descriptors: *Sampling, *Trace elements, *Industrial wastes, *Municipal wastes, Particle size, Cadmium, Filters, Zinc, Lead, Nickel, Copper, *Air pollution, *Pollutant identification.

An EPA stack sampling train was described for the measurement of trace metals from a power plant, municipal incinerator, zinc smelter and a steel mill. The 'back half' of the train was found to collect in-significant amounts of specific trace metals. A particle sizing sampling head fitted to the working end of the EPA stack probe indicated a segregation of trace metals toward the submicron par size ranges. Over fifty per cent by weight of the cadmium in some samples was found in the sub-micron size range. A significant difference in the cadmium concentrations was found in the material collected on the glass fiber filter as compared to the probe backwash. For relatively cool stacks (180-400F) the cadmium concentration was from 2 to 40 times greater in the material collected on the glass fiber filter, whereas in a hot stack (1200F), the reverse was found by a factor of approximately 2.0. (See also W75-05277) (Jerigan-Vanderbilt) W75-05575 DETERMINATION OF A TRACE ELEMENT MASS BALANCE FOR A COAL-FIRED POWER

Colorado Univ., Boulder. Dept. of Chemical En-

gineering. J. W. Kaakinan, and R. M. Jorden.

In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., p 170-184, March, 1974. 3 fig. 4 tab, 21 ref.

Descriptors: *Trace elements, *Coals, *Fossil fuels, *Power plants, Sampling, Gases, Analytical techniques, Spectroscopy, X-rays, Fluorescence, Arsenci compounds, Copper, Iron, Lead, Tin, Zinc, Radioactivity, *Pollutant identification, *Colorado Colorado. Identifiers: Boulder(Colo).

A mass balance for sixteen elements at a coal-fired power plant has been determined. Samples were obtained from Unit No. 5 of the Valmont Power Plant located near Boulder, Colorado and owned by the Public Service Company of Colorado. Unit No. 5 burns low sulfur pulverized coal or natural gas and has a maximum power output of 180 megawatts. This unit is unique in that particulate emissions are controlled by a mechanical collector followed by an electrostatic precipitator in parallel with a wet scrubber. Samples were collected during three days of scrubber-precipitator performance tests. Samples included coal, bottom ash, mechanical collector hopper ash, electrostatic precipitator hopper ash, scrubber slurry, scrubber make-up water, and particulates sampled isokinetically at the inlet to the scrubber and at the outlets to the precipitator and scrubber. The variety of types of samples required the use of several different handling and preparation techniques. Concentration measurements using wet chemistry, atomic absorption spectroscopy, and x-ray fluorescence spectroscopy have allowed the calculation of a mass balance for arsenci, copper, iron, lead, molybdenum, niobium, rubidium, selenium, strontium, tin, yttrium, zinc and zirconium and for the radioactive species lead-210, polonium-210, and radium-226. (See also W75-05277) (Jernigan-Vanderbilt) W75-05576

CHARACTERIZING STEEL MILL DUST.

Purdue Univ., Lafayette, Ind. B. L. Dow, and K. J. Yost.

In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 185-197, 8 fig, 1 tab, 6 ref.

Descriptors: *Dusts, *Particle size, *Air pollution, *Steel, Industrial wastes, Metallurgy, Cadmium, Zinc, Lead, Filters, Electron microscopy, X-rays, Analytical techniques, Iron Managanese, Trace elements, *Pollutant identification, *Waste elements, * identification.

This paper focused on the emissions from the pyrometallurgical processes associated with the steel industry. The concentrations of cadmium, zinc, and lead in the emissions and the extent to which metals tend to concentrate in different size ranges were examined. The possibility of identifying steel mill emission particles collected on high olum filters has also been investigated. If the emission from a source can be poorly characterized, it should be possible to identify these emissions when they are found at some distance away from the source. A JSM-U3 scanning electron microscope equipped with an energy disper-sive x-ray analysis system was used to characterize the steel mill emissions. Using the relative concentrations of Fe, Zn, Ca, Pb, and Mn it was not only possible to identify particles emitted from a steel mill but in certain cases to identify the steel

Group 5A—Identification Of Pollutants

mill process from which the particle originated. (See also W75-05277) (Jerigan-Vanderbilt)

THE RATE OF MERCURY LOSS FROM CON-TAMINATED ESTUARINE SEDIMENTS IN BELLINGHAM BAY, WASHINGTON, Washington Univ., Seattle. Dept. of Oceanog-For primary bibliographic entry see Field 5B.

W75-05578

CHARACTERIZATION OF CADMIUM AND NICKEL CONTAMINATED SEDIMENTS FROM

FOUNDRY COVE, NEW YORK, Oak Ridge National Lab., Tenn. E. H. Bondietti, F. H. Sweeton, T. Tamura, R. M. Perhac, and L. D. Hulett.

In:Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-mission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 211-224, 7 tab, 1 fig, 9 ref.

Descriptors: *Cadmium, *Nickel, *Sampling, *Industrial effluents, Separation techniques, Elecrincinstrate rincins, separation techniques, Electron microscopy, Ions, Calcium, Sediments, Aquatic life, Analytical techniques, Spectroscopy, Cobalt, Zinc, Oxidation, Laboratory tests, Rivers, *New York, *Pollutant identification. Identifiers: Foundry Cove(NY).

Two sediment samples contaminated with cadmium and nickel from Foundry Cove, New York were studied and characterized in cooperation with New York University Medical Center. Con-centrations of cadmium and nickel in the sample (designated NY2) closest to a nickel-cadmium battery plant discharge were about 40,000 and 32,000 ppm, respectively. Another sample (NY1), obtained about 100 yds from the discharge point, contained 2100 ppm Cd and 780 ppm Ni, respectively. Techniques used in characterizing the sample included density gradient separation, x-ray diffraction, electron microscope-electron probe analysis, and a cadmium specific ion electrode. Results show that most of the cadmium in NY2 is in a mixed calcuim-cadmium carbonate system, while organic constituents in NY1 appear to hold most of the nickel and cadmium. Despite the larger amount of cadmium present in NY2, and the fact that the bulk of the cadmium in each sample is present in a different form, solution-phase levels were quite similar, indicating that the two sediments may not present distinctly different hazards to aquatic organisms. Biological availability studies are needed to clarify this point. (See also W75-05277) (Jerigan-Vanderbilt) W75-05579

CADMIUM ACCURAL IN A COMBINED WASTEWATER TREATMENT-AQUACULTURE

Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5C.

A SOIL AND GROUND-WATER POLLUTANT TRANSPORT MODEL, Union Carbide Corp., Oak Ridge, Tenn. Computer

Sciences Div. For primary bibliographic entry see Field 5B. W75-05581

ANALYSIS OF TRACE METAL MASS BALANCE FOR AQUEOUS SYSTEMS, Colorado Univ., Denver. Dept. of Biom For primary bibliographic entry see Field 5B. W75-05582

MODEL COMPUTER FOR CHEMICAL EXCHANGE IN THE STREAM SYSTEM, Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div. For primary bibliographic entry see Field 5B. W75-05583

MODELING ATMOSPHERIC DISPERSION OF LEAD FROM AUTOMOTIVE SOURCES, Colorado State Univ., Fort Collins. Dept. of Atmospheric Science. For primary bibliographic entry see Field 5B. W75-05584

NORMALIZATION AND INTERPRETATION OF ATMOSPHERIC TRACE ELEMENT CON-CENTRATION PATTERNS, Maryland Univ., College Park. Dept. of Chemis-

For primary bibliographic entry see Field 5B. W75-05585

MODELING OF PARTICULATES IN GARY, IN-DIANA AREA, Battelle Columbus Labs., Ohio.

For primary bibliographic entry see Field 5B. W75-05586

EFFECTS OF SURFACE IRRIGATION WITH DAIRY MANURE SLURRIES ON THE QUAL TY OF GROUNDWATER AND SURFACE RU-NOFF.

Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B. W75-05606

BIOLOGICAL POLLUTION INDICATORS IN UNDERGROUND WATERS. (IN SLOVENIAN), Kemijski Institut Boris Kidric. Ljubljana (Yugoslavia). M. Rejic.

Biol Vestn Vol 21, No 1, p 11-15, 1973. English summary.

Descriptors: *Ground water, Rivers, Yugoslavia,

Chemical and biological investigations of the Pivka-Unica underground flow (Yugoslavia) were carried out. The Pivka River is polluted when it goes underground but through self-purification it becomes relatively clean before confluence with the Rak. Typical representatives of subterranean waters and inhabitants of the Pivka surface flow were found among the animals living in the Pivka-Unica underground flow. Changes occurring in the chemistry of the underground flow were compared with the species composition of animals which are characteristic of underground waters. Some species of gastropods, and of amphipod or isopod crustaceans might be practicable indicators of underground water pollution.--Copyright 1974, Biological Abstracts, Inc. W75-05616

PYRROLIDONE-A NEW SOLVENT FOR THE

PYRROLLIDONE-A NEW SOLVENT FOR THE METHYLATION OF HUMIC ACID, Geological Survey, Denver, Colo.

R. L. Wershaw, D. J. Pinckney, and S. E. Booker. Available from Superintendent of Documents, GPO Washington, D.C. 20402, \$3.15 in paper copy, \$2.25 in microfiche. Journal of Research of the U.S. Geological Survey, Vol 3, No 1, p 123-126, January-February 1975. 1 fig, 1 tab, 22 ref.

Descriptors: *Humic acids, *Chemical analysis, *Solvents, Organic matter, Mass spectrometry, Analytical techniques, Solvent extractions, *Pollutant identification, Chemical reaction. Identifiers: *Pyrrolidone, *Methylation.

Humic acid may be dissolved in 2-pyrrolidone and methylated by the addition of diazomethane in diethyl ether and ethanol to the solution. Because of the Humic acid is completely dissolved in the reaction medium, disaggregation of the humic acid particles takes place and much more complete methylation is obtained. The methylated products may be fractionated by countercurrent distribution and analyzed by mass spectrometry. (Knapp-W75-05631

WATER-QUALITY DATA OF THE SACRA-MENTO RIVER, CALIFORNIA, MAY 1972 TO **APRIL 1973.**

Geological Survey, Menlo Park, Calif. L. J. Britton, and R. C. Averett. Open-file report, July 15, 1974. 2 fig, 7 tab, 25 ref.

Descriptors: *Water quality, *California, Rivers, Trace elements, Suspended load, Dissolved solids, Nutrients, Phytoplankton, Periphyton, Benthos, Pollutant identification, Path of pollutants. Identifiers: *Sacramento River(Calif).

Measurements of suspended sediemnt, major dissolved chemical constituents, selected trace elements and plant nutrients, phytoplankton, periphyton, and benthic organisms were made at five sampling sites along a 175-mile reach of the Sacramento River, California between Red Bluff and Knights Landing. The study period began in May 1972 and continued on a near monthly basis through April 1973. Mean suspended-sediment concentrations ranged from a low of 3 milligrams per litre at two upstream sampling sites in July and September to a high of 566 mg per litre at one downstream sampling site in January. The dis-solved-solids concentration ranged from a low of 75 mg per litre at one upstream site in September to a high of 135 mg per litre at the lowermost site in August. Phytoplankton concentrations increased in a downstream direction to a high of 980 cells per millilitre at one downstream site in September. The diatoms were the dominant group of algae present, both in numbers and diversity, at all sampling sites. The diversity of benthic organisms decreased in a downstream direction. The Diptera, especially members of the family Chironomidae, were the most commonly found organisms at all sites. (Knapp-USGS) W75-05635

PESTICIDES IN STREAMS--1968-71. SELECTED WESTERN

Geological Survey, Austin, Tex. Water Resources

J. A. Schulze, D. B. Manigold, and F. L. Andrews. Pesticides Monitoring Journal, Vol 7, No 1, p 73-84, June 1973. 3 fig, 3 tab, 9 ref.

Descriptors: *Pesticide residues, *Monitoring, *Pollutant identification, Water pollution, Water pollutants, Surface waters, Streams, Water quality, *Chlorinated waters, Streams, Water hydrocarbon pesticides. Identifiers: *Western US.

Chlorinated insecticides and herbicides were stu-Chionnated insecticioes and neroscioes were studied in western U.S. streams, 1968-71. Heptachlor and its epoxide were not detected during the 3-year period, and aldrin was found only once. DDT was the most frequently occurring insecticide, and 2,4,5-T the most common herbicide. The amounts observed were small; the maximum concentration of an insecticide was 0.46 micrograms per litre for DDT, and of an herbicide 0.99 micrograms per litre for 2,4-D. Concentrations were highest in water samples containing appreciable amounts of suspended sediments. Beginning in July 1970, the phosphorothioate insecticides--parathion, methyl parathion, malathion, and diazinon—were determined monthly on all samples. Malathion was not found during this period. Polychlorinated biphenyl (PCB's) compounds which were monitored for beginning in October 1969 were also detected at two stations. (Knapp-USGS)

W75-05704

Identification Of Pollutants-Group 5A

W75-05653

THE DETECTION AND STUDY OF NITRIFICA-TION IN STREAMS AND ESTUARIES, Rutgers-the State Univ., New Brunswick, N.J. Dept. of Fnvironmental Services.
T.J. Tuffey.
Doctor of Philosophy Thesis, January 1973. 180 p,
20 fig, 77 ref. OWRT B-027-NJ(4).

Descriptors: *Nitrification, Water quality, *Biochemical oxygen demand, *Oxygen demand, Oxygen sag, Aeration, *New Jersey, Streams, Estuaries, *Pollutant identification.

Identifiers: *Nitrosomonas, *Nitrobacter, Warburg respirometer, *Passaic River(NJ), Artificial

Nitrifying phenomena in streams and estuaries were investigated in order to characterize the nitrifying activity of physically different aquatic environments. An evaluation was first made of the existing tools used for the detection and study of nitrification. The Warburg respirometer, BOD bottle techniques, and the chemical analyses for oxdized nitrogen species were compared. Bacterial growth curves for both Nitrosomonas and Nitrobacter were obtained from laboratory systems to determine the potential generation time n an inland river and to relate organism concentration with nitrifying activity. The results from these two phases of research were applied to field studies of three inland waterways and literature evidence of estuarine nitrification. A hypothesis was formulated which identifies nitrifying activity with shallow, surface active streams and long de-tention time rivers and estuaries.

DISCRIMINATION OF WASTE OILS BY MICRO EMISSION SPECTROCHEMICAL ANALYSIS,

ANALISIS, Spectrogram Corp., North Haven, Conn. J. D. Johnson, and H. R. Gram. Available from the National Technical Informa-Trion Service, Springfield, Va. 22161, as AD787 717, \$4.25 in paper copy, \$2.25 in microfiche. Report No CG-D-21-75, June 1974. 52 p, 11 fig, 15 tab, 18 ref. DOT-CG-33-185A.

Descriptors: *Instrumentation, *Spectrometers, *Oil wastes, Metals, Testing, *Oil pollution, Estuaries, Sampling, Analytical techniques, Data collections, Evaluation, *Pollutant identification. Identifiers: Spectrochemical analysis.

The discrimination of waste oil from unused oil products, when recovered from the surface of navigable waters, is made by the determination of the metallic content of the oil. A microemission spectrochemical technique was developed, together with a low-power, pulsed, high frequency spark discharge source. Tests were conducted on samples exposed to laboratory extractions of sea water. Tests were also conducted on samples naturally weathered on the surface of brackish tidal water from an estuary. Iron, lead, copper, and sil-icon were selected as the key elements which identify an oil as a waste. A conceptual design of a compact, portable direct reading instrument, based on this study, was included. (Sims-ISWS) W75-05680

A QUANTITATIVE AND QUALITATIVE SUR-VEY OF OILS AND TARS STRANDED ON GAL-VESTON ISLAND BEACHES, Texas A and M Univ., Galveston. Center for

Marine Resource S. M. Ray, R. K. Oja, L. M. Jeffrey, and B. J.

S. M. Ray, R. R. Oja, L. M. Jettrey, and B. J. Presley.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD787-718, \$4.75 in paper copy, \$2.25 in microfiche. Report No CG-D-10-75, January 1974. 78 p, 11 fig, 10 tab, 13 ref. DOT-CG-23681-A.

Descriptors: *Oil pollution, Beaches, *Texas, Sampling, Seashores, *Gulf of Mexico, Oil, Gas chromatography, Spectrophotometry, X-ray diffraction, Analytical techniques, On-site data collections, *Pollutant identification. Identifiers: *Tar, *Galveston Island(Tex)

Strandings of oil and tar on Galveston Island beaches were assessed for 1 year. Oil-tar deposition was quantified on three designated test plots -80, 120, 160, feet long. All oil pieces greater than 0.025 inch occurring between the high tide (strand line) and water line were collected at 1 to 2 day intervals. Heaviest accumulations occurred during spring and summer. Peak months of deposition spring and summer. Peak months of deposition were: April 1972, 31, 420 gms; July 1972, 19, 666 gms; March 1973, 14,867 gms. Average daily accumulations for the three test plots were: 80 feet, 108 gms; 120 feet, 154 gms; 160 feet, 215 gms. These data suggest that an 80 foot test plot is adequate for such sampling. Most materials collected were tars or tar-like residues that appeared to be highly weathered. There did not appear to be a consistent. weathered. There did not appear to be a consistent relationship between oil accumulation and wind speed and direction. Efforts to correlate oil deposition with shipping traffic was unsuccessful because of incomplete ship traffic data. Representative oil tar samples were analyzed periodically. Most of the samples analyzed appear to be the result of man's activities. Chromatograms of 49 samples appear to fall in five slected categories of general sources: (1) crude oil residues, 41%; (2) crude oil sludge residues (Bimodal), 20%; (3) residual fuel oil residues, 27%; (4) distillate oil residues, 2%; (5) highly weathered residues and low pariffin of indeterminate origin, 10%. The vanadium-nickel ratios of most of the samples were above 3. Thus, they are typical of some foreign crudes such as Venezuelan. (Sims-ISWS) W75-05681

CATION EXCHANGE CHARACTERISTICS OF CATION EXCHANGE CHARACTERISTICS OF SOME METAL IONS IN NITRIC ACID-AM-MONIUM ACETATE MEDIUM, Allahabad Univ. (India). Chemistry Labs.
A. Mahan, A. K. Ghose, and A. K. Dey. Separation Science, Vol 6, No 6, p 781-789, December, 1971. 2 fig, 4 ref, 3 tab.

Descriptors: *Cation exchange, *Heavy metals, *Ion exchange, *Separation techniques, Inorganic compounds, Resins, Magnesium, Aluminum, Iron, Manganese, Cobalt, Nickel, Copper, Zinc, Gold, Mercury, Lead, *Pollutant identification.

Cation exchange equilibrium distribution coefficients with Amberlite IR-120 have been determined for 20 metal ions in media consisting of mixmined for 20 metal ions in media consisting of mix-tures of 0.1M HN03 and varying concentrations, viz., 0.01, 0.05, 0.25, and 1.2M, of ammonium acetate. The metal concentrations were so chosen that the ratio of total amount of cation to total resin capacity is approximately 0.4, sufficient to ensure exchange. The values of separation factors of various metal ion pairs have also been evalu-ated, and separation possibilities for ins in a ated, and separation possibilities for ins in a number of binary and ternary mixtures have been proposed. (Jernigan-Vanderbilt) W75-05686

DETERMINATION OF GOLD. DIRECT COBALT, AND LITHIUM IN BLOOD PLASM USING THE MINI-MASSMANN CARBON ROD ATOMIZER.

Amsterdam Univ. (Netherlands). Lab. for Analyti-

cal Chemistry.
F.J. M. J. Maessen, F. D. Posma, and J. Balke.
Analytical Chemistry, Vol 46, No 11, p 1445-1449,
September, 1974. 10 fig, 3 tab, 18 ref.

Descriptors: "Heavy metals, "Gold, "Cobalt, "Spectroscopy, Instrumentation, Analytical techniques, Biology, Laboratory tests, Testing procedures, Automation, Statistics, "Pollutant identification.

Identifiers: "Lithium, Atomic absorption spec-

troscopy, Sample preparation.

Direct determination of gold, cobalt and lithium in blood plasma at the ppm level was performed by means of flameless atomic absorption using the carbon rod atomizer. The major causes of variability - viz. sample introduction and alteration of the properties of the graphite - have been experimentally investigated. A remarkable gain in precision has been obtained by means of instrumentally controlled sample introduction. Regression analysis has been applied to the calibration curves and confidence limits were calculated. Fluctuations of the absorbance signals proved to be affected not only by the reproducibility errors but also by procedural errors. A comparison of analytical results obtained with both the carbon rod atomizer and a gas stabilized dc arc is given for gold and cobalt analyses in blood plasma. (Jernigan-Vanderbilt) W75-05702

SPECTROPOLARIMETRIC DETERMINATION OF COPPER (II), NICKEL (II) AND IRON (III) IONS WITH N-CARBOXYMETHYLPYR-ROLIDINE-2-CARBOXYLIC ACID, Turin Univ. (Italy). Istituto di Chimica Analitica. For primary bibliographic entry see Field 2K.

CADMIUM IN PLANTS, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 21.

MERCURY, CADMIUM, AND CHROMIUM IN THE NETHERLANDS, (LE MERCURE, LI CADMIUM ET LE CHROME AUX PAYS-BAS), Central Lab. TNO, Delft (Netherlands). For primary bibliographic entry see Field 5B. W75-05710

EXPERIMENTAL STUDY OF THE ACCUMU-LATION OF SILVER 110M IN VARIOUS MARINE ORGANISMS, (ETUDE EXPERIMEN-TALE DE L'ACCUMULATION DE L'ARGENT 110M CHEZ DIVERS ORGANISMES MARINS). B. Pouvreau, and J-C. Amiard.

Report No CEA-R-4571, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, Department de 'Protection, April, 1974, 19 p, 10 fig, 2 tab, 21

Descriptors: *Marine algae, *Marine animals, *Radioisotopes, *Radioecology, Aquatic environ-ment, Water pollution, Mollusks, Crustaceans, Fish, Time of concentration, *Pollutant identifica-Identifiers: *Silver.

Seawater was contamined to 3.33 microcuries/liter by silver 110M as a chloride. The different experimental species were introduced into the contaminated environment when the radioactivity of the water had stabilized (around 2 weeks). For most species, the concentration factors decreased as a function of the complexity of the organisms, a phenomena already noted for other radioactive elements. The most significant contamination of the hepato-pancreas and the liver was apparently related to the storage role of these organi. The gills of molluscs and crustaceans were also contaminated. This was perhaps due to the large surface area of this organ and to its role of trapping particles in suspension. The concentration fa of silver 110M in the edible molluscs studied were relatively high, which indicated this pollutant should not be neglected in the sanitary area. It was often observed that the concentration factors for silver 110M were of the same order of magnitude as those measured for stable silver. (Pullman-Van-W75-05711

Group 5A—Identification Of Pollutants

METHODS FOR THE ANALYSIS AND IDENTIFICATION OF ORGANOLEPTIC SUB-THE TECHNOLOGICAL WATER TREATMENT STANCES (RAZRABOTKA METODOV ANALIZA TOPOTIERIKATERI IDENTIFIKATSII ORGANOLEPTICHESKIKH VESHCHEST' V TEKHNOLOGICHESKOM VESHCHEST' TEKHNOLOGICHESKOM PROTSESSE PODGOTOVKIVODY), L. A. Mel'nichenko, I. T. Goronovskii, and A. I.

Sakevish.

Khimicheskaya Tekhnologiya, No 4, p 61-63, July/August, 1974. 2 fig, 1 tab, 15 ref.

Descriptors: *Waste water treatment, *Taste, *Odor, *Water purification, Organoleptic properties, Algae, Analytical techniques, Chromatography, Pigments, Organic acids, Phenols, Organic compounds, Taste-producing algae, Water quality, Water pollution sources, Pollutants, *Pollutant identification, Chemical analysis, Water pollution. Identifiers: Essential oils, Fatty acids, Dnieper

In water purification plants, odor and taste are presently evaluated by subjective organoleptic tests. Considering the necessity of automating this part of the purification process, a study was con-ducted on metabolites of algae as the most common sources of objectionable water odor and taste. Column, gas, and thin-layer chromatography were used to analyze water from the Dnieper River and the algal populations collected during the period of water 'bloom'. The results of the analysis are presented and discussed. The ether extracts obtained contained pigments (usually decomposed), fatty acids, essential oils, phenols, other compounds. The extracts contained more than 50 components, including about 34 hydrocarbon compounds. Full identification of components of these complex mixtures will help solve the deodorization problem in surface water purification plants. (Stapinski-IPC) W75-05724

LITERATURE SURVEY OF INSTRUMENTAL MEASUREMENTS OF BIOCHEMICAL OXYGEN DEMAND FOR CONTROL APPLICA-TION 1960-1973,

National Environmental Research Center, Cincinnati, Ohio. Methods Development and Quality Assurance Research Lab.

For primary bibliographic entry see Field 5D. W75-05753

SIMULTANEOUS AND AUTOMATED DETER-MINATION OF TOTAL PHOSPHORUS AND TOTAL KJELDAHL NITROGEN, National Environmental Research Center, Cincin-

M. E. Gales, and R. L. Booth.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-232 710, \$3.75 in paper copy; \$2.25 in microfiche. Report No EPA-670/4-74-002, May 1974. 22 p, 3 fig, 10 tab, 8 ref, 1 append.

Descriptors: *Analytical techniques. Phosphorus, "Nitrogen, "Measurement, "Automation, Amino acids, Chemical analysis, Water analysis, Sewage effluents, Saline water. Identifiers: "Total phosphorus, "Total Kjeldahl

Milbury's method for the simultaneous determina tion of total phosphorus and total Kjeldahl nitrogen (TKN) in activated sludge has been modified for the automated determination of these constituents in surface waters, domestic and industrial wastes. Modifications were made to increase the sensitivity and to improve the accuracy for samples that contain amino acids. Au-toAnalyzer I and II systems were developed with the helix digestion using a mixture of sulfuric acid, perchloric acid, and vanadium pentoxide as a catalyst. The applicable range is 0.10 to 10 mg N/l and 0.02 to 1.0 mg P/l. The phosphorus values obtained by this method on river water samples were comparable to those obtained by the Environmental Protection Agency Automated Single Reagent Method. The TKN values were also comparable those obtained by the micro TKN method. This method may be used to determine phosphorus in saline waters with the addition of a dilution line on Manifold 1. However, organic nitrogen in saline waters cannot be determined by this method. (Jones-Wisconsin) W75-05756

THE RELEASE OF PHOSPHORUS FROM POND SEDIMENTS AND ITS AVAILABILITY
TO LEMNA MINOR L.,
Rutgers - The State Univ., New Brunswick, N.J.

Dept. of Soils and Crops.
For primary bibliographic entry see Field 5C.
W75-05789

HOW TO READ A FISH KILL,

Environmental Protection Agency, Washington, D.C. Office of Water Programs.

L. E. Keup. Water and Sewage Works, Vol 121, No 7, p 48-51, July 1974. 1 fig.

Descriptors: *Fishkill, *Water pollution, Toxicity, Water conservation, Investigation, *Pollutant

Teams are more effective than individuals in determining the causes and finding the solutions to fish kills. The knowledge of time required for a water mass to travel from one point to a downstream point is basic to the investigation. Information on diffusion rates of dumped materials will further the investigation, along with observations on the nature of a pollutant's entry into the river and its mixing with water mass. Seasons have considerable influence on the magnitude of fish kills. For example, less dead fish rise to the surface in cold water. Synergism and antagonism should be taken into consideration in a fish kill, as well as habitat. The history of water discharges from dams should be investigated in fish kills downstream from dams. Finally, human ignorance is often a cause of fish kills, while sophisticated poachers may sometimes use fish toxicants. (Leibowitz-FIRL) W75-05812

AUTOMATIC WATER SAMPLER,

W. Sutherland.

U.S. Patent No. 3,853,009, 4 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 929, No 2, p 544, December 10, 1974.

Descriptors: *Patents, Water pollution, *Water sampling, *Sampling, Pollutants, Water quality, *Quality control, Equipment, *Pollutant identification.

Identifiers: *Pollution detection.

Apparatus for automatically collecting liquid samples, as for use in measuring water pollution in-cludes a small metallic sampling cup suspended by a cable for immersion in the body of liquid to be sampled. A reversible electric motor drives a winch for the cable to raise and lower the sampling cup. There is a tilting receiver unit for dumping liquid from the full cup in its uppermost position into a collecting bucket. The motor is provided with a reversing relay which when de-energized operates the motor in a first or lowering direction for the sampling cup. The cup includes a pair of spaced electrodes, one of which is defined by the metallic bottom wall of the cup. The electrodes are conductively bridged by a predetermined level of liquid in the cup to energize the reversing relay for operation of the motor in the opposite or lifting rection. (Sinha-OEIS)

METHOD AND APPARATUS FOR MONITOR-ING POLLUTION OF NATURAL WATERS, Environmental Research Inst. of Michigan, Ann

Arbor. (assignee) R. Horvath.

U.S. Patent No. 3,852,997, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 929, No 2, p 540, December 10, 1974.

*Temperature, *Patents, Descriptors: *Evaporation, *Monitoring, Water pollution, Water quality, Equipment, *Pollutant identifica-

Identifiers: *Pollution detection, Wet bulb temperature, Sensors, Evaporative rates.

A method and apparatus are described which utilize means for detecting the difference in evapora-tive rates of two different liquids. Wet bulb temperature readings are used to determine the presence of pollutants which differ significantly in evaporative rate from that of the natural water which they pollute. Liquid from a portion of the natural water which may become polluted is used to wet one temperature sensor while natural water which cannot simultaneously be polluted is used to wet another temperature sensor. The evaporative rates are determined at or substantially at ambient temperature and means is provided for comparing any difference in these evaporative rates to indicate the presence of pollutants. (Sinha-OEIS) W75-05823

DETERMINING VOLATILE ORGANICS AT MICROGRAM-PER-LITER LEVELS BY GAS CHROMATOGRAPHY,
National Environmental Research Center, Cincin-

nati, Ohio. Methods Development and Quality As-

nau, Onlo. Methods Development and Quanty Assurance Research Lab.
T. A. Bellar, and J. J. Lichtenberg.
Journal of the American Water Works Association. Vol 66, No 12, p 739-744, December 1974. 7 fig, 8 tab, 15 ref.

Descriptors: *Pollutant identification, *Gas chromatography, *Instrumentation, *Analytical *Instrumentation, *Anal Descriptors: "Analytical techniques, "Organic wates, "Organic compounds, Chemical wastes, Oily water, Water quality, Volatility, Chromatography, Chemical analysis, Testing procedures, Water quality control, Chemistry, Solvent extractions, Organic

A method was presented for the quantitative recovery of volatile organic compounds. A description was given of the apparatus and procedures employed to detect 0.5 micro-grams/liter of the substances. (Henley-ISWS) W75-05838

SOLVENTS IN SEWAGE AND INDUSTRIAL WASTE WATERS: IDENTIFICATION DETERMINATION.

Lancashire River Authority (England).

W. K. Ellison, and T. E. Wallbank. Water Pollution Control, Vol 73, p 656-671, 1974. 14 fig. 1 tab. 4 ref.

*Industrial wastes, *Analytical Descriptors: *Industrial wastes, *Analytical technique, *Solvent extractions, *Oil wastes, Evaluation, Chemical analysis, Water analysis, Separation techniques, Water quality, Water polynomia analysis, Chemical lution sources, Organic compounds, Instrumenta-tion, Measurement, Sewage, Gas chromatog-raphy, Distillation, Spectroscopy, Solvents, *Pollutant identification.

Identifiers: Chlorinated hydrocarbons, Absorption spectra, Cyclohexane,

The use of the equipment adopted by the British Pharmacopoeia Commission for the determination of volatile oil in drugs was described. The applicaof volatile of in diags was described. The application of gas chromatography and ultraviolet and infrared spectroscopy to the identification and determination of the separated solvent residues was critically assessed. The use of infrared and ul-

Sources Of Pollution-Group 5B

traviolet spectroscopy in conjunction with gas chromatography is an extremely powerful technique for the detection and identification of traces of immiscible solvent residues in samples of industrial waste waters, sewages, and sludges. The presence of petroleum products will often mask the presence of traces of aromatic hydrocarbons and other solvents containing carbon-oxygen and carbon-chlorine bonds by gas chromatography. These can readily be detected and identified by infrared and ultraviolet spectroscopy is these circumstances. (Henley-ISWS)
W75-05840

NITROCHROMEAZO TITRIMETRIC DETER-MINATION OF SULFATE IN IRRIGATION AND

OTHER SALINE WATERS,
Agricultural Research Service, Phoenix, Ariz.
Water Conservation Lab.
B. A. Rasnick, and F. S. Nakayama.
Commum Soil Sci Plant Anal. Vol 4, No 3 p 171-

Descriptors: *Analytical techniques, *Volumetric analysis, *Sulfates, Irrigation water, *Saline water, Effluents, Waste water(Irrigation). Identifiers: Barium, Nitrochromeazo,

Sulfate in various types of aqueous solutions such as soil-water extracts, sewage effluents, irrigation water and well water can be determined rapidly and accurately by a volumetric technique. The in-direct method is based on the formation of the urect method is based on the formation of the barium-nitrochromeazo complex. Using a water-acetone medium sharpens the end point and adding NH4F at low pH controls interferences. — Copyright 1974, Biological Abstracts, Inc. W75-05848

5B. Sources Of Pollution

CHLORIDES IN LAKE ERIE BASIN, State Univ. of New York, Buffalo. Dept. of Civil

Engineering.
D. D. Meredith, R. R. Rumer, C. C. Chien, and R.

Available from the National Technical Inform Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 964, \$4.75 in paper copy, \$2.25 in microfiche. Water Resources and Environmental Engineering Research Report 74-1, October 1974. 82 p. 23 fig, 16 tab. OWRT B-044-NY(1). 14-31-0001-5095.

Descriptors: *Lake Erie, *Chlorides, Salts, Mathematical models, *New York, Runoff, *Urban runoff, Combined sewers, Drainage, Path of pollutants. Identifiers: Deicing salts, *Buffalo(NY).

The de-icing salt runoff from Buffalo, New York and selected nearby communities has been measured in the case of Buffalo, approximately 90% of the de-icing salt applied is recovered by the com-bined sewer system. The Lake Erie drainage basin was subdivided into regions and a search of the literature was made to establish the historical data for chloride discharge from each region. Time-dependent equations were estimated for the annual chloride discharge from each source region and used in conjunction with a mathematical model for chloride balance in Lake Erie. It was possible to fairly reproduce the historical trend of chloride build-up in Lake Erie by this method. The rainy reproduce the historical trend of childbuild-up in Lake Erie by this method. The calibrated model projects a chloride concentration in Lake Erie of 135 ppm by the year 2050. The effects of a few selected salt management programs on future chloride levels in Lake Erie are examined utilizing the model. W75-05355

NITROGEN BUDGET OF A NORTH CAROLINA ESTUARY, North Carolina State Univ., Raleigh. Dept. of

Zoology. W. G. Harrison.

Available from the National Technical Informa-Avanate Iron the National Technical Information Service, Springfield, Va 22161 as PB-239 999, \$7.00 in paper copy, \$2.25 in microfiche. PhD Thesis, 1974. 172 p, 32 fig, 26 tab, 93 ref, 4 append. OWRT B-052-NC(2), 14-31-0001-3917.

Descriptors: *Nitrogen cycle, *Ammonium, *Nutrients, Mass balance, *Urea, Estuaries, Eutrophication, *North Carolina, Absorption, *Path of pollutants, Water pollution effects. Identifiers: *Pamlico River(NC).

Nitrogen concentrations in the Pamlico River estuary changed seasonally with highs occurring in winter and early spring and lows occurring in summer. Of the five forms of nitrogen measured (nitrite, nitrate, ammonium, dissolved organic and particulate nitrogen), the dissolved organic fraction was the largest. Concentrations of total inorganic nitrogen varied over distance and over time. basically reflecting nitrate fluctuations. Seasonal peaks in nitrite and nitrate concentrations occurred in winter with concentrations at barely detectable levels in summer. Concentrations were consistently higher upstream and were reduced to low levels near the mouth of the estuary during all seasons. Ammonium was present in relatively high concentrations year round and was distributed uniformly throughout the estuary. Dissolved organic nitrogen concentrations were at least equivalent to inorganic nitrogen concentrations most of the year. Biological uptake and release were the most important pathways of nitrogen transformation. The calculated annual inorganic nitrogen budget for the estuary revealed that of the total inorganic nitrogen entering the system, nearly 40% disappeared. The predominant form in the tributary inputs was nitrate, which was reduced to nearly undetectable concentrations be-fore leaving the estuary; nitrite followed a similar pattern. In contrast, ammonium concentrations in inflowing waters increased. At present, nitrogen appears to be a major factor limiting the production of the estuary although the amounts entering have caused no noticeable ill effects. (McJunkin-North Carolina State) W75-05357

AGRICULTURAL AND FOREST LAND RU-NOFF IN UPPER SOUTH RIVER NEAR WAYNESBORO, VIRGINIA, Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Environmental Sciences and

Engineering. E. V. Southerland.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 967, \$5.75 in paper copy, \$2.25 in microfiche. MS Thesis, September 1974. 136 p, 15 fig, 19 tab, 77 ref, append. OWRT A-053-VA(1).

Descriptors: *Path of pollutants, Chemical oxygen demand, Conductance, Phosphorus, Nitrogen, Nitrates, Iron, *Runoff, *Virginia, *Organic matter, *Nutrients, *Effluents, Drainage, Water pollution sources, *Agricultural runoff, Urban runoff, Turbidity, *Suspended solids, Organic com-Identifiers: *South River(Va).

Sources and yields of organic matter, suspended solids, and nutrients in the Upper South River Basin were investigated during the summer low flow period of 1974. Parameters monitored at sampling stations in the basin included chemical ox-ygen demand, total suspended solids, turbidity, ygen temant, total suspended solus, tutodky, specific conductance, total phosphorus, total Kjeldahl nitrogen, nitrate, and iron. These data were used with flow and drainage area data to determine the relative magnitude and daily yields of materials from various sources. Sources of organic matter, suspended solids, and nutrients entering the South River included agricultural, forest and urban land drainage, as well as domestic and industrial wastewater effluents. The yields of materials from the various sources were computed during an intense storm in May, wet weather flow in June, and dry

weather flow in July. During the short term period weather frow in July. During the short term period of high storm flows, land runoff was the primary source of all pollutants. On the long term basis, however, wastewater effluents were the major contributors of all parameters except total suspended solids.

W75-05358

THE THREE DIMENSIONAL HEATED SUR-FACE JET IN A CROSS FLOW, Johns Hopkins Univ., Baltimore. Chesapeake Bay

H. H. Carter, and R. Regier. Technical Report 88, References 74-8, November 1974. 70 p, 38 fig, 4 tab, 16 ref.

Descriptors: *Model studies, *Thermal power-Descriptors: "Model studies, "Inermal power-plants, "Thermal pollution, "Cooling water, "Heat exchange, Water pollution effects, Environmental effects, "Chesapeake Bay, Bodies of water, Nuclear powerplants, "Sites, Coastal structures, Seawater, Geothermal studies, Discharge(Water), Movement, Dispersion, Estuaries.

The overall goals are to develop improved analytical and numerical models having general applica-bility for the prediction of the temperature dis-tribution in the thermal plume from a condenser cooling water discharge; to develop design criteria for siting powerplants on estuarine and coastal waters; and to develop field techniques for quantitating the distribution of excess heat from an operating generating station. Although this research has emphasized problems associated with nuclear powerplant siting on the Chesapeake Bay, results have application to other marine environ-ments, as well as to large fresh water bodies such as the Great Lakes. Investigations have supplied knowledge concerning: (a) the rate of initial mechanical dilution in a plume of heated water discharged as a surface or subsurface horizontal iet into natural water bodies; (b) the physical processes of loss of excess heat to the atmosphere across the air-sea boundary. A numerical model has been developed known as the Pritchard model. (Houser-ORNL) W75-05360

SHIPPING CONTAINER FOR PLUTONIUM-238 AS FISSILE MATERIAL CLASS 1, Los Alamos Scientific Lab., N.M. For primary bibliographic entry see Field 5G. W75-05364

ANALYTICAL MODELING OF THERMAL DISCHARGES: A REVIEW OF THE STATE OF

THE ART,
Vanderbilt Univ., Nashville, Tenn.
B. A. Benedict, J. L. Anderson, and E. L. Yandell,

Available from the National Technical Informarevalue from the reducing feedings information Service, Springfield, Va. 22161, as REPT. No. ANL/ES-18, \$7.60 in paper copy, \$2.25 in microfiche. Report ANL/ES-18, April 1974. 321 p, 105 fig. 23 tab, 148 ref.

Descriptors: *Reviews, *Water pollution, *Water pollution sources, *Nuclear powerplants, *Model studies, *Thermal pollution, Pollution abatement, Technology, Mathematics, Heated water, Rivers, Lakes, Ponds, Discharge(Water), Measurement, Outflow, Heat budget, Evaporation, Behavior, Analysis, Evaluation.

Available techniques are described for mathemati-cal modeling for discharges of heated waters into rivers and lakes and for the operation of cooling ponds. General factors affecting heated-water discharges are discussed, including entrainment and diffusion, receiving-water stratification and flow rate, among others. The general elements of the heat budget are also reviewed. For all models recently account of the heat budget are also reviewed. For all models are appropriate and model limitations are presented, assumptions and model limitations are included, along with the basic theory, necessary equations, available verification, and numerical

Group 5B-Sources Of Pollution

examples. Solutions are included for important cases of the warm-water wedge. Four models for surface discharges of heated water are reviewed in depth. Several others are referenced. Submerged discharges, both single and multiple port, are covered. Both round and slot jets are included, and the availability of models for stratified and and the availability of models for stratified and nonstratified receiving waters, and for stagnant or flowing receiving waters, is cansidered. For the single-port discharges, as well as the surface-discharge models, means of estimating times of exposure are presented. Cooling-pond analysis emphasizes idealized pond behavior, with discus-sion on the behavior and analysis of real ponds. The effect of choice of evaporation formula on pond design is assessed. (Houser-ORNL) W75-05370

SIGNIFICANCE OF STABLE IODINE-127 IN

New York State Dept. of Environmental Conser-

vation Albany. W. J. Kelleher, and H. R. Prins.

Available from Sup Doc, Print. Office, Wash, D.C. as REPT. No. RDDRA4 15(9) 1974. Radiation Data and Reports, Vol 15, No 9, p 567-573, September 1974. 3 tab, 16 ref.

Descriptors: *Iodine, *Fallon, *Radioactivity, *Radioisotopes, *Path of Pollutants, Food chains, Milk, Public health, Human population, Biology, Absorption.
Identifiers: *Thyroid, Radiation source, Fuel

The unexpected high concentrations of stable iodine in milk found when studying the specific acitivty concept for iodine-129 around a nuclear fuels reprocessing plant led to an evaluation of the use of iodine-129 to iodine ratio in milk samples to calculate population doses. In oder to use specific activity to calculate thyroid dose, it will be neces sary to establish values for the concentration of iodine in thyroids. If a constant concentration of iodine in the thyroid is assumed and there is a high enough concentration of iodine in the milk to be able to assume that milk is the only source of iodine in the thyroid, a relationship between thyroid dose and iodine-129 to iodine or iodine-131 to iodine ratios can be developed. The use of specific activity in milk to determine dose will have the greatest application in evaluating the man-rem dose from the discharges of iodine-129 from fuel processing plants. (Houser-ORNL) W75-05373

RADIATION DATA: SECTION II. WATER. Office of Radiation Programs, Washington, D.C. For primary bibliographic entry see Field 5A. W75-05374

ENVIRONMENTAL LEVELS OF RADIOAC-TIVITY AT ATOMIC ENERGY COMMISSION ISTALLATION,

Office of Radiation Programs, Washington, D.C. For primary bibliographic entry see Field 5A. W75-05375

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1973, Naval Ship Systems Command, Washington, D.C. Nuclear Propulsion Directorate. M. E. Miles, G. L. Sjoblom, and J. D. Eagles. Available from Sup Doc, U.S. Gov. Print. Office, Wash. D.C. as REPT No. RDDRA4, 15(10) (1974). In: Radiation Data and Reports, Vol 15, No 10, p 625-646, October 1974. 26 fig, 5 tab, 28 ref.

Descriptors: *Ships, *Naval architecture, *Water pollution sources, *Radioactivity, Assessment, Monitoring, Sampling, Radioactive waste disposal, Liquids, Sediment, Oceans, Harbors, Analytical techniques, Cobalt, Tritium.

Identifiers: "Nucelar submarines, Shipyards.

The ships and support facilities include 103 U.S. naval nuclear-powered submarines and 4 nuclearnavai nucrear-powered submannes and 4 fuclear-powered surface ships, 9 shippards, 11 tenders, and 2 submarine bases. The environmental effect of disposal of radioactive wastes originating from U.S. Naval nuclear propulsion plants and their support facilities is assessed. The total radioactivity, less tritium discharged to all ports and harbors from the more than 100 Naval nuclear-powered ships and supporting tenders, Naval bases and shipyards was less than 0.002 curie in 1973. This report confirms that procedures used by the Navy to control releases of radioactivity from U.S. nuclear-powered ships and their support facilities are effective in protecting the environment and the health and safety of the general public. (Houser-W75-05376

RADIATION DATA. SECTION II. WATER, Office of Radiation Programs, Washington, D.C. For primary bibliographic entry see Field 5A. W75-05377

RADIATION DATA. SECTION IV. OTHER DATA. ENVIRONMENTAL LEVELS OF RADIOACTIVITY AT ATOMIC ENERGY COMMISSION INSTALLATIONS,

Goodyear Atomic Corp., Piketon, Ohio. For primary bibliographic entry see Field 5A. W75-05378

CONTAMINATION LIMITS FOR REAL AND PERSONAL PROPERTY, PROGRESS REPORT, JULY-DECEMBER 1973, Los Alamos Scientific Lab., N. Mex. For primary bibliographic entry see Field 5A.

ANNUAL REPORT ON PROJECT ANOIISA,

FISCAL YEAR 1974, Argonne National Lab., Ill.

S. M. Fried, A. M. Friedman, and L. A. Quarterman.

No. ANL-8115, \$4.00 in paper copy, \$2.25 in microfiche. Report ANL-8115, July 1974. 12 p, 10

Descriptors: *Radioactivity, *Dispersion, *Groundwater, *Petrology, Transport, *Computer programs, Absorption, Plutonium, Migration, *Path of pollutants. Identifiers: *Actinides, *Lithosphere.

Three types of measurements relating to the migration of actinide elements in the lithosphere have been performed. These were studies of surface-absorption coefficients, migration coefficients, and transport along the surfaces of fis-sures. A computer analysis of the fissure experiments indicates that all these phenomena are re-lated and can be understood in terms of surface absorption. In addition, it has been found that at least two migratory forms of plutonium are present. (Houser-ORNL)
W75-05382

NUMERICAL STUDIES OF CRATERING IN BEARPAW SHALE: TWO-DIMENSIONAL RESULTS,
California Univ., Livermore, Lawrence Liver-

more Lab. For primary bibliographic entry see Field 8H. W75-05385

REVIEW OF THE ENGINEERING ASPECTS OF POWER PLANT DISCHARGES, Hydronautics, Inc., Laurel, Md. S. J. Daugard, and T. R. Sundaram.

Available from NTIS, Springfield, Va. as REPT No. PB-235 783. \$5.25 in paper copy, \$2.25 in microfiche. Maryland State Dept. of Natural Resources, Annapolis, Power Plant Siting Program, Report PPSP-MP-12, October 1973. 113 p, 44 fig, 5 tab, 69 ref.

Descriptors: *Water pollution, *Thermal pollution, *Thermal capacity, Chemical properties, Chemical reactions, *Waste disposal, *Wastewater treatment, *Powerplants, Coolants, tion, *The Cooling water, Technology, Assessment, Economics, Engineering, *Review, *Maryland.

A necessary prerequisite to making assessments of the ecological impact of power plant discharges is a delineation of the engineering factors affecting these discharges. A comprehensive inventory of discharges and treatment techniques of fifteen fossil-fueled power plants in the Maryland region. The inventory covers thermal effluents, chemical discharges from cooling and boiler water treat-ment systems as well as discharges from auxiliary systems. The acquired data are used to assess vari ous control strategies and trade-offs. Improvements required in the state-of-the-art are given also. (Houser-ORNL) W75-05386

SOME ASPECTS OF THE EFFECTS OF ELEVATED WATER TEMPERATURE ON THE RAMSHORN SNAIL, Du Pont de Nemours (E. I.) and Co., Aiken, S.C.

Savannah River Lab. For primary bibliographic entry see Field 5C. W75-05387

A PROPOSED RAINOUT HAZARD MODEL FOR SYSTEMS ANALYSIS STUDIES, California Univ., Livermore. Lawrence Liver-

more Lab. T. F. Harvey.

Available from NTIS, Springfield, Va. as REPT. No. UCRL-51658. \$4.00 in paper copy, \$2.25 in microfiche. Report UCRL-51658, September 1974. 10 p, 4 fig, 13 ref.

Descriptors: *Nuclear explosions, *Civil defense, *Hazards, Analysis, *Fallout, *Wet seasons, *Model studies, Damages, Radioactivity effects, Meteorology, Human population, Density, Mortality, System analysis Identifiers: Weapons, Demography.

Rainout from nuclear airbursts presents a potential residual radiation hazard to civilian populations. A rainout hazar model for use in nuclear weapon system studies is proposed. The model includes a summer synoptic weather system, a large-cloud diffusion code, and a simple demographic distribution of a heavily populated industrialized area. A primitive estimate of the number of casualties that might be expected from a l-kt airburst weapon is calculated. (Houser-ORNL) W75-05388

MINERALOGY AND ION EXCHANGE CHARACTERISTICS OF SAVANNAH RIVER PLANT STREAMBED SEDIMENTS, Du Pont de Nemours (E. I.) and Co., Aiken, S.C.

annah River Lab. R. H. Hawkins.

Available from NTIS, Springfield, Va. as REPT. No. DPST-71-332. Report DPST-71-332, 1971. 14 p, 5 fig, 1 tab, 21 ref.

Descriptors: *Sediments, *Sediment transport, *Silting, *Water quality, *Soils, Sampling, Analytical techniques, Analysis, Soil analysis, Clays, Organic matter, Cation exchange, Minerology, Sands, Silts, *South Carolina.

Identifiers: *Savannah River(So Car), *Bottom

Sources Of Pollution—Group 5B

The objective was to characterize the bottom sediments of Savannah River Plant (SRP) streams to gain a better understanding of their capacity to influence water quality. Samples were collected of bottom sediments from three SRP streams and of soils from the source areas of the sediments. The some source area to the seminins. It is samples were analyzed for clay and organic matter contents, cation exchange capacity (CEC), and mineralogy of the sand, silt, and clay fractions. Quartz is the dominant mineral in the sand and silt fractions; kaolinite is the dominant mineral in the clay fractions; and no illits, chlorite, vermiculite, or montmorillonite minerals are present. The average clay content of the sediments is 32% by average clay content of the sediments is 32% by weight; the average organic matter content of the sediments is 1.267 by weight; the average CEC of the sediments is 2.61 meq per 100 g; the highest sorptive capacity is in the downstream sediments near and in the Savannah River swamp. (Houser-W75-05389

MICROBIOLOGY OF WATER, (LITERATURE

Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.

E. E. Geldreich.

Journal Water Pollution Control Federation, Vol 46, No 6, p 1355-1372, June, 1974. 123 ref.

Descriptors: *Water pollution, *Microbiology, *Microorganisms, Coliforms, E. coli, Waste water, Chlorination, Rivers, Streams, Lakes, Ponds, Reservoirs, Potable water, Groundwater

ronds, Reservoirs, Potable water, Groundwater effluents, "Reviews, "Bibliographies, "Pollutant identification, "Path of pollutants. Identifiers: Fecal streptococci, Anaerobic lac-tobacilli, Natural waters, Indicator bacteria, Waterborne pathogens, Bacterial count, Receiving

Findings of several studies made regarding microbial pollution indicators are presented. Particular attention is focused on distribution of coliforms, E. coli, fecal streptococci, and anaerobic lactobacilli in water sources. Various methods and materials used in determining counts of indicator bacteria and waterborne pathogens are considered in detail, including rapid techniques for detection of bacterial populations in water sources. Research done with respect to the microbiology of rivers, lakes, ponds, and reservoirs is discussed. The microbiology of potable water and ground-water is examined. (Nelson-FIRL) W75-05400

TRACE METAL ASSOCIATIONS IN SUB-ARC-TIC FJORD ENVIRONMENTS, PROGRESS RE-PORT MAY 1972-MARCH 1974, Alaska Univ., College. Inst. of Marine Science. D. C. Burrell.

Progress Report, RLO-2229-TI-27, May, 1972-March, 1974, 147 pages, 5 fig, 26 ref. (6 reprints, 5 abstracts, 12 cruise reports).

Descriptors: *Fjords, *Oceans, *Trace elements, *Metals, *Analytical techniques, *Alaska, Glaciers, Spectrophotometry, Estuaries, Saline water-freshwater interfaces, Sedimentation, Hydrography, Oceanography, Movement, *Pollutant identification, *Path of pollutants. Identifiers: Prince Williams Sound(Alas), Resurrection Bay(Alas).

This report summarized the work in progress under this study. It also contained collection publication reprints and abstracts of papers read for the period covered by the report, and also cruise reports for September, 1972 to December, 1973. The ports for September, 1972 to December, 1973. The work in progress encompassed the areas of (1) fjord studies, (2) inorganic soluble chemical species, and (3) trace analysis. Hydrographic and sedimentation surveys were conducted throughout Blue Fjord in Prince Williams Sound in conjunction with trace metal sampling. Another fjord field site, Resurrection Bay, enabled year round monitoring of conditions and analysis in some detail of physical circulation patterns and some aspects of biota cycling in the water column. An initial attempt was made to describe the distribution of oxygen in the deep basin waters of Resurrection Bay in late oceanographic winter. The special charac-teristics of the fjords were noted to offer unrivaled opportunities to study inorganic metal complexes, which should aid in the understanding of the pathways and kinetics between the major solid phase reservoirs. Due to more stringent analytical requirements, the study has had to also work on developing analytical techniques for trace heavy metals in sea water. The study has concentrated on the use of flameless atomic absorption and anodic stripping voltammetric analysis. (See W75-05404 W75-05405 and W72-13973) (Pulliam-Vanderbilt) W75-05403

EXTRACTION OF COBALT, IRON, INDIUM AND ZINC FROM SEAWATER BY MEANS OF THE TRIFLUOROACETYLACETONE

THE TOLURE SYSTEM,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A. W75-05404

DETERMINATION OF HEAVY METALS IN SEAWATER BY CARBON FILAMENT ATOMIC SPECTROMETRY,

Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 5A. W75-05405

DETERMINATION OF BUDGETS OF HEAVY METAL WASTES IN LONG ISLAND SOUND, ANNUAL REPORT, PART I, Connecticut Univ., Groton. Marine Sciences Inst.

P. Dehlinger, W. F. Fitzgerald, S. Y. Feng, D. F.

Paskausky, and R. W. Garvine.

Available from the National Technical Information Service, Springfield, Va. 22161, as COM-73-11735, \$5.25 in paper copy, \$2.25 in microfiche. First Annual Report, June, 1973. 103 p, 17 fig, 14 tab, 22 ref, 3 append.

Descriptors: *Trace elements, *Water pollution, *Heavy metals, *Path of pollutants, Ocean currents, Coasts, Mercury, Lead, Cadmium, Zinc, Circulation, Absorberger, Carents, Coasts, Mercury, Lead, Cadmium, Zinc, Circulation, Absorberger, Carents, Circulation, Absorption, Shellfish, Oysters, Estuaries, Sediment transport, Rivers, Copper, Identifiers: *Long Island Sound.

This study consisted of five integrated research projects with the objective of determining budgets of heavy metal wastes in Long Island Sound. The projects concern: (1) the fates and concentrations of heavy metals in the water column; (2) the concentrations and effects of these metals in oysters; (3) the water circulation patterns which control water renewal times and flushing rates; (4) the structure and motion of the outflow of the Connecticut River into Long Island Sound; and (5) the transport of suspended materials in the Sound. Emphasis during the first year was on the eastern area of the Sound. The study was presented in two parts. This volume contains the first three projects. (See also W75-05411) (Jernigan-Vanderbilt) W75-05410

DETERMINATION OF BUDGETS OF HEAVY METAL WASTES IN LONG ISLAND SOUND, ANNUAL REPORT, PART II,

Connecticut Univ., Groton. Marine Sciences Inst. P. Dehlinger, W. F. Fitzgerald, S. Y. Feng, F. Paskausky, and R. W. Garvine.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as COM-73 11736, \$4.75 in paper copy, \$2.25 in microfiche. First Annual Report, June, 1973. p 79, 33 fig, 3 tab,

Descriptors: *Trace elements, *Water pollution, *Rivers, *Sediment transport, *Currents(Water), Aerial photography, Discharge(Water), Salinity. Identifiers: *Long Island Sound.

This study consisted of five integrated research projects with the objective of determining budgets of heavy metal wastes in Long Island Sound. The projects concern: (1) the fates and concentrations of heavy metals in the water column; (2) the concentrations and effects of these metals in oysters; (3) the water circulation patterns which control water renewal times and flushing rates; (4) the structure and motion of the outflow of the Connecticut River into Long Island Sound; and (5) the transport of suspended materials in the Sound. Emphasis in the first year was on the eastern area of the Sound. The study was presented in two parts. This volume contains reports on projects 4 and 5. (See also W75-05410) (Jernigan-Vanderbilt) W75-05411

CALCULATED DISTRIBUTION OF CHEMICAL SPECIES OF COPPER, ZINC, CADMIUM AND LEAD IN 16 LAKES OF

NORTHERN ITALY,
European Atomic Energy Community, Ispra
(Italy). Joint Nuclear Research Center.

M. F. Baudouin, and P. Scoppa.

Available from the National Technical Information Service, Springfield, Va. 22161 as EVR-5052E, \$6.50 in paper copy, \$2.25 in microfiche. Report No EUR 5052e, Commission of the European Communities, Luxembourg, February, 1074, p 88, 64 fig, 66 tab, 4 ref.

Descriptors: *Distribution, *Copper, *Zinc, *Cadmium, *Lead, Hydrogen ion concentration, Ionization, Heavy metals, Anions, Chemical reactions, Cations, Freshwater, Lakes, Model studies, Analytical techniques. Identifiers: *Italy.

An ion association model was used to estimate the short range interactions between some heavy metal ions and the major anions present in freshwater. In addition, the effect of pH changes on the distribution of the chemical species of each metal was taken into consideration. The pH dependent model for seawater was adapted to the speciation of Cu, Zn, Cd, and Pb in freshwaters. The anions considered were C1(-), SO4(2-), HCO3(-), CO3(2-), and OH(-). The results were presented in graphic and tabular form. The calculations showed that the metals examined can be complexed to a considera-ble extent and that the distribution of the chemical species of the metals varies greatly with changes of pH and water composition. A few examples of the implications of this approach in biological studies on freshwater organisms were also given. (Pulliam-Vanderbilt) W75-05413

MERCURY: ASPECTS OF ITS ECOLOGY AND ENVIRONMENTAL TOXICITY,

Hawaii Univ., Honolulu. Dept. of Botany.

N. M. Siegel.

Available from the National Technical Information Service, Springfield, Va. 22161 as N74-22960, \$4.25 in paper copy, \$2.25 in microfiche. Semi-Annual report, Hawaii Botanical Science Paper No 33, p 58. 6 fig, 5 tab, 58 ref.

Descriptors: *Mercury, *Toxicity, *Environmental effects, *Ecology, *Path of pollu-*Toxicity, Volcanoes, Gases, Soil analysis, Sediments, Fossil fuels, Water pollution sources, Soil contamination, Air pollution effects, Public health

The first part of this report was a historical review of the development of uses of and awareness of the toxicity of mercury. Minamata disease and or-ganic mercury poisoning, biological alkylation, the mercury in fish scale and mercury in the environ-ment were some of the topics covered in this

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review, which concluded the extent of man's contribution to the overall amounts of Hg in the environment is unclear. The second part of the report attempted to summarize the available data on Hg in the Hawaiian environment and assess the relative importance of natural and industrial sources. Some of the principal findings supporting the con-clusion that Hg enters the Hawaiian environment as a natural product were listed. No major indus-trial source of Hg could be identified in Hawaii. There was a suggestion that some mercury sedi-ments in the Ala Wai Canal are associated with boating, probably due to the use of mercury-containing anti-fouling paints. Fumarole gases in vol-canic areas of Hawaii were found to contain 2.2 -40.5 micrograms Hg/cu m. Atmospheric transport from geothermal areas on Hawaii as well as the general volcanic history of the island chain ap-peared to offer the best explanation for the presence of Hg in various materials in the Hawaiian environment. (Pulliam-Vanderbilt) W75-05414

TRANSPORT FATE AND GEOCHEMICAL IN-TERACTIONS OF MERCURY, CADMIUM AND OTHER INORGANIC POLLUTANTS IN THE COASTAL LITTORAL-SALT MARSH ENVIRONMENT OF THE SOUTHEASTERN UNITED STATES.

Skidaway Inst. of Oceanography, Savannah, Ga. Available from the National Technical Informa Standard Home National Technical Michigan tion Service, Springfield, Va. 22161 as PB-227 035, \$5.75 in paper copy, \$2.25 in microfiche. Skidaway Institute of Oceanography, Savannah, Georgia, Progress Report, May, 1973. 130 p, 45 fig, 14 tab, 12 ref.

Descriptors: *Estuaries, *Path of pollutants, *Heavy metals, *Seasonal, *Organic matter, Onsite tests, Iron, Copper, Manganese, Mercury, Cadmium, Lead, Rivers, Inorganic compounds, Organic compounds, Flocculation, Coasts, Distribution, *Salt marshes, *Southeast U.S.

Iron, manganese, copper, mercury, cadmium and lead concentrations in estuaries of eight rivers of the southeastern Atlantic coast were determined on a bi-monthly basis between May and December, 1972. In addition, SO4, NH4, NO3 and PO4 concentrations were also obtained for the same estuaries during that period, although no seasonal patterns were apparent. Of the metals only mercury and cadmium showed seasonal patterns in concentration in solution. Observations of metal concentrations in particulate phases suggested that copper and possibly lead are related to total organic carbon. In salt marsh sediments mercury concentrations were related to total organic carbon. The rate of accumulation of all the metals studied was obtained with Fe greater than Mn greater than Pb greater than Cu greater than Cd greater than Hg. Preliminary results of studies of dissolved organic matter characteristics and flocculation were presented. The design of studies to determine characteristics of metal complexing with organic acids was also presented. A tentative model for metal transport to and fate in the coastal littoral-salt marsh system was discussed in relation to preliminary data. (Jernigan-Vanderbilt) W75-05416

INVESTIGATION OF SOME FACTORS IN THE BIOCHEMICAL CONVERSION OF MERCURY POLLUTANTS TO TOXIC METHYLMERCURY EFFECTED BY MICRO-ORGANISMS IN A MARINE SEDIMENT, Naval Academy, Annapolis, Md.

M. McKinney.

Available from the National Technical Information Service, Springfield, Va. 22161, as AD-749 674, \$4.75 in paper copy, \$2.25 in microfiche. Trident Scholar Project Report No. 32, U.S. Naval Academy, May, 1972 89 p, 15 fig, 1 tab, 148 ref.

Descriptors: *Mercury, *Path of pollutants, *Biochemistry, *Microorganisms, *Sediments,

Toxicity, Organic compounds, Inorganic compounds, Experimental models, Analytical techniques, Chelation, Oxygen, Model studies. Identifiers: "Methylmercury.

Some of the factors involved in the conversion of mercury pollutants to toxic methyl-mercury micro-organisms in marine sediments were investigated. Research resulted in the definition of the two primary problems: modeling and analysis. A successful modeling technique was developed, after restrictions in design were found desirable. A successful analytical technique, which had not been applied as such to biological samples, was developed and used with good results. The two techniques (model and analytical technique) were then combined in an investigation of the conversion factors: (1) pollutant type and level; (2) conversion time; (3) movement of water over the sediment (removal of Me-Hg produced); (4) chelation; (5) eutrophication; (6) oxygen content of the water above the sediment. The investigation showed that above the sediment. The investigation showed that long-term mercury pollution results primarily from slow conversion of large Hg(+2) deposits to toxic methyl-mercury by methanogenic micro-organisms found largely in marine sediments. The investigation into the biochemical reactions showed that many pathways of conversion are possible under varying environmental (Jernigan-Vanderbilt) conditions W75-05417

THE ENVIRONMENTAL FLOW OF CADMIUM AND OTHER TRACE METALS: VOLUME I,

Purdue Univ., Lafayette, Ind. K. J. Yost, W. Bruns, J. E. Christian, F. M. Clikeman, and R. B. Jacko.

Available from the National Technical Informa Avanatic from the National Technical Information Service, Springfield, Va. 22161, as PB-229 478, \$11.25 in paper copy, \$2.25 in microfiche. Progress Report, July 1, 1972 to June 30, 1973. 440 p, 151 fig, 140 tab, 34 ref.

Descriptors: *Path of pollutants, *Cadmium, *Trace elements, *Heavy metals, *Industrial wastes, Zinc, Lead, Water pollution, Waste disposal, Agronomy, Soil science, Aquatic environment, Meteorological data, Wildlife habitats, Industrial plants, Environmental effects, Ecology, Indiana, Great Lakes region.

The project was composed of two basic components; (a) collaborative research with industrial and waste processing facilities whose process streams contain significant amounts of cadmium, zinc, lead and other heavy metals, and (b) environ-mental studies to identify translocation mechanisms, distribution and fate of cadmium, lead and zinc in theurbanized, heavily industrial-ized Chicago-East Chicago-Gary area bodering the southern rim of Lake Michigan. The objectives for the first year of the present study with respect to (a) were to identify, enlist the cooperation of, and initiate sampling programs in pertinent industrial and waste processing facilities. Objectives for component (b) were to evaluate the scope of metal contamination in the Chicago-East Chicago-Gary study area and to choose specific ecosystems and metal transport mechanisms for subsequent, more intensive study. Volume I includes reports on (1) industrial/waste disposal studies in zinc smelting, industrial/waste disposal studies in zinc smelting, steelmaking, electroplating, and municipal waste incineration; (2) agronomic aspects of cadmium and other trace metals in N.W. Indiana cropland and non-agricultural soils, in phosphate fertilizers, and in sewage sludge; (3) aquatic ecology in separate studies of a borrow pit, lake and river; (4) meteorological studies; and (5) metal levels in N.W. Indiana wildlife species. (See also W75-05432) (Pulliam-Vanderbilt) W75-05431

THE ENVIRONMENTAL FLOW OF CADMIUM AND OTHER TRACE METALS: VOLUME II,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 7C.

W75-05432

THE INFLUENCE OF BIG CYPRESS LAND DEVELOPMENT IN THE DISTRIBUTION OF HEAVY METALS IN EVERGLADES ESTUA-

RIES, Florida State Univ., Tallahassee. Marine Lab

Available from the National Technical Information Service as PB-231 941, \$6.25 in paper copy, \$2.25 in microfiche. South Florida Environmental Project, Ecological Report No. DI-SFEP-74-11, March 1973. 174 p, 19 fig, 60 tab, 86 ref.

escriptors: *Land development, *Heavy metals, *Estuaries, *Path of pollutants, *Agriculture, Trace elements, Water pollution, *Florida, Agricultural runoff, Rainfall-runoff relationships, Saline water-freshwater interfaces, Environmental effects, Manganese, Iron, Copper, Zinc, Cadmium, Lead, Salinity, Drainage. Identifiers: *Big Cypress Swamp(Fla).

To make a quantitative assessment of the effects of agricultural utilization of drained land in the Big Cypress Swamp on the estuaries of the northwestern Everglades, the distribution, cheminorthwestern bevergates, the distribution, chemi-cal fractionation, and flux rates of Mn, Fe, Co, Cu, Zn, Cd, and Pb were determined along with certain environmental parameters. An intensive study was conducted in an area consisting of active and dormant farm lands drained by the Bar-row River Canal system and Chokoloskee Bay, which receives the discharge of this canal. Dissolved iron concentrations decreased sharply over the salinity gradient during both seasons, while other metals showed a net increase in concentration particularly during the wet period. Concentra-tion levels of heavy metals in Chokoloskee Bay were 1.5 to 3 times higher than those present in other everglades estuaries receiving natural drainage and the dgree of enrichment increased during the wet season. Although metal concentrations in the Barron River Canal and Chokoloskee Bay were above natural levels, only iron and lead exceeded recommended maximum values of the federal water quality criteria. It was reported the concentration levels of Cu, Zn, Cd, and Pb may ave adverse effects on some organisms. (Pulliam-Vanderbilt) W75-05434

NITRATE MOVEMENT IN SOIL UNDER

EARLY SPRING CONDITIONS, Wisconsin Univ., Madison. Dept. of Agricultural Engineering. M. F. Walter.

Available from the National Technical Informa-Available 11th Relational Technical Information Service, Springfield, Va 22161 as PB-240 094, \$6.25 in paper copy; \$2.25 in microfiche. PhD Thesis, 1974. 147 p, 16 tab, 35 fig, 108 ref, append. OWRT B-076-WIS(1). 14-31-0001-3946.

Descriptors: *Farm wastes, Water pollution sources, *Frozen soils, *Fertilizers, *Leaching, *Path of pollutants, Farm management, *Nitrates, Nitrogen, Soil profiles, *Soil water movement, Dispersion, Absorption, Computer models. Identifiers: *Pasture management.

Physical transport mechanisms and chemical transformations of nitrogen were investigated and a quantitative mathematical model was developed of manurial nitrogen movement through soil profiles under typical early spring conditions. Nitrogen transformation studies were conducted with batch systems of Plainfield sand and annerobic dairy waste. Laboratory soil columns were used to investigate flow and transport processes. The specific conditions studied were temperatures from 0 to 20C, soil moisture from 5 to 20 percent by dry soil weight, soil pH from 6 to 8, and aerobic soil environment. The quantity of nitrate in an in-cremental volume of soil depended upon its move-ment in or out of the soil volume due to mass flow of water and to the net production of nitrate within the volume of soil due to mineralization of organic nitrogen and nitrification of ammonium. Nitrate accumulation as predicted by the computer model

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was based on nitrification of added manurial ammonium and soil nitrogen mineralization. Esti-mates of solute dispersion were made based on the movement of the soil water after infiltration.

Laboratory soil columns incubated at different temperatures and with differing volumes of infil-tration were used to simulate field soil conditions resulting after heavy land applications of anaero-bic liquid dairy waste. Nitrogen measurements from these soil columns were compared with pre-dictions from the computer model.

ADSORPTION OF PHOSPHORUS BY UNSATU-

RATED SYNTHETIC SOIL, Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering. E. D. Millette.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 116, \$7.25 in paper copy; \$2.25 in microfiche. PhD The-sis, May 1974. 180 p, 54 fig, 21 tab, 224 ref, 10 ap-pend. OWRT A-021-IND(4).

Descriptors: *Phosphorus, *Unsaturated flow, *Anion adsorption, *Soil water movement, *Waste water treatment, Moisture tension, Surfaces, Adsorption, Phosphorus radioisotopes, Water pollution sources.

Identifiers: Langmuir isotherm, Freundlich equation.

Various concentrations of potassium phosphate solution were admitted to short soil columns in a reaction chamber. The phosphate solution contained a tracer which was chemically the same as the main solute. After reaction, the effluent was collected and the amounts of phosphate removed determined. The removal was a function of the soil water tension as well as the inlet concentration of phosphorus and the relative presence of clay in the soil. The higher the soil water tension, the higher the inlet concentration and the greater the clay fraction, the greater were the amounts of phosphate adsorbed by the soil. Of the four adsorption equations examined, the Langmuir and the Freundlich equilibrium adsorption isotherms gave the best prediction of uptake. Not enough data were available to differentiate between the efficiency of each curve. Purely chemical considerations tend to favor the Langmuir curve as the better predictor. However, none of the equations served as valid prediction of observed concentra-tion effects when soil water pressure changes occur. An expression designed to account for pressure changes is proposed. W75-05463

THE RELATIONSHIP BETWEEN WATER-FOWL AND NITROGEN SPECIES IN THE WATERS OF THE BOSQUE DEL APACHE, New Mexico Inst. of Mining and Technology,

Socorro. Dept. of Chemistry.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 182, \$4.25 in paper copy; \$2.25 in microfiche. Master of Science Thesis, 1973. 51 p, 9 tab, 17 fig, 25 ref. OWRT A-038-NMEX(3).

Descriptors: *Rio Grande River, *Migratory birds, Nitrogen compounds, Ducks, Geese, Nitrates, Nitrites, Ureas, Aerobic bacteria, Anaerobic bacteria, Shallow water, *New Mexico, Seasonal, Eutrophication, Ions, Ammonium compounds,

Waterfowl.

Identifiers: *Bosque Del Apache National Wildlife Refuge(NMex), Seasonal fluctuations.

A two year study of nitrogen in the waters of the Bosque Del Apache National Wildlife Refuge, New Mexico, has been conducted. Conclusions were: (1) Nitrogen levels in deep waters were higher than surface water levels. Kjeldahl, nitrate (and nitrite) and ammonium ions, uric acid and urea accumulated in deep water. Attachment to

soil particles and settling to the pond-bed were the main reasons for this accumulation. (2) Dif-ferences in breakdown rates of uric acid in clear water and in turbid water suggested that microbes were associated in some way with the particles in the water. Surface waters had lower microbial activity than bottom waters. Anaerobic bacteria were in greater numbers in bottom water. Bacteria were sediment-bound and accumulated in the pond-bed. The rapid degradation of uric acid in sediment-high water was attributed to the inseument-ngn water was attributed to the in-creased numbers of bacteria in sediment. (3) The insolubility of uric acid, at the pH values found in Bosque waters, was one explanation that only trace amounts of uric acid were found in water. It is suspected that any uric acid released adhered to particles which sank to the pond-bed causing accumulation of uric acid in sediment. (4) Heavy population concentrations of waterfowl add significant nitrogen to water systems. Water leaving the Bosque contains higher levels of nitrogen than that which enters the refuge. The major part of the nitrogen from waterfowl is in the form of uric acid which is insoluble and is apparently retained in the Refuge. (Hain-New Mexico State) W75-05469

TRANSPORT MECHANISMS OF LEAD INDUS-

TRY WASTES, Missouri Univ., Rolla. Dept. of Civil Engineering. Presented at 28th Annual Purdue Industrial Waste Conference, May 1-3; Lafayette, Indiana, 1973. 19 p, 6 fig, 2 tab, 11 ref. NSF(RANN) Lead Study Program.

Descriptors: *Lead, *Industrial wastes, *Water quality, *Mining, *Pollution abatement, Mine water, Heavy metals, Flotation, Surface runoff, Analytical techniques, Spectroscopy, Effluents, *Missouri, *Path of pollutants. Identifiers: New Lead Belt(Mo).

The lead pollution problems encountered from mining what is called the 'New Lead Belt' in S.E. Missouri were studied with special emphasis on transport mechanisms of heavy metals through the ecosystem, the changes in the water quality due to mining operations, and the techniques used to abate these changes. The mining activities of the region have produced several sources of water pollution: (1) mine water pumped from the subsur-face operations which contains finely crushed rock, oils, and dissolved minerals (2) water from the milling process containing heavy metals and organic flotation reagents and (3) surface runoff rich in heavy metal particulates blown from mill and smelter concentrate piles or tailings onto the forest floor of Clark National Forest. Another major problem has been the biological transport of heavy metals where mine and mill effluents have stimulated excessive algal growths in receiving streams. The concentration of heavy metals by these benthic growth is environmentally undesira-ble because: (1) phytoplankton serve as a flood source for consumer forms which may concentrate the heavy metals at a higher trophic level in the food chain and (2) algae are only temporary accumulators and the materials will float into another ecosystem. The study indicated that the mining operations should continue: (1) separation of mine and mill water; (2) treatment of the minewater by one or more retention ponds, and (3) recycle the mill wastewaters. (Jernigan-Vanderbilt) W75-05486

INFLUENCE OF ENDRIN ON SOIL MICROBI-AL POPULATIONS AND THEIR ACTIVITY, Forest Service (USDA), Portland, Oreg. Pacific Northwest Forest and Range Experiment Station. W. B. Bollen, and C. M. Tu. Research Paper, PNW-114, 1971. 4 p, 3 tab, 80 ref. PNW-1602.

*Pesticides, Application methods, *Path of pollutants, Water pollution effects.

Endrin applied to soil at rates of more than three times the maximum that might be expected from application of endrin-treated tree seed had no appreciable effect on numbers of soil organisms or on ammonification, nitrification, or sulfur oxidation. Decomposition of soil organic matter increased significantly in the presence of endrin. (Forest Service) W75-05497

DISSOLVED ORGANIC CARBON (DOC), AN INDEX OF ORGANIC CONTAMINATION IN WATER NEAR CALIFORNIA,

Geological Survey, Garden Grove, Calif. Water Resources Div. For primary bibliographic entry see Field 5A. W75-05502

HEAVY METAL CONCENTRATIONS DEPOSITION IN BULK PRECIPITATION IN ECOSYSTEMS MONTANE

Cornell Univ., Ithaca, N.Y. Dept. of Ecology and Systematics.

W. H. Schlesinger, W. A. Reiners, and D. S.

Environ Pollut. Vol 6, No 1, p 39-47. 1974 Illus. Identifiers: *Air pollution, California, Deposition, Ecosystems, *Heavy metals, Montane areas, *New Hampshire, Pollution,
*Precipitation(Atmospheric), Lead, Mercury,
Cadminum, Pollutant identification, *Path of pol-

Concentrations of Pb, Hg and Cd in bulk precipita-tion were measured at 4 heights along an 886 m elevational gradient in New England during 4 mo. of 1971. Weighted average concentration of Pb, determined by atomic absorption spectrophotometry, was 13.4 micro g/1. The mean deposition rate was 54 micro g/n2/day and an extrapolated value for mean annual deposition was 20 mg/m2, 18 times higher than that reported as derived from marine air in the mountains of California, but lower than that reported in urban areas where airborne heavy metals are released in high concentrations by human acitivities. These values suggest that New England receives a relavalues suggest that New England receives a rea-tively high deposition of Pb due to its continental downwind position. Much of this Pb probably originates from human activities. Cd and Hg conoriginates from human activities. Ca and rig con-centrations averaged 0.6 and 0.06 micro g/1 and deposition rates averaged 2.4 and 0.2 micro g/m2/day, respectively. These bulk precipitation measurements probably underestimate the total deposition at high elevations since they do not ac-count for cloud water condensation and aerosol impaction .-- Copyright 1974, Biological Abstracts, W75-05509

A PROCEDURE FOR PLACING LARGE UNDIS-TRUBED MONOLITHS IN LYSIMETERS. Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences. For primary bibliographic entry see Field 2G. W75-05517

MINERALOGY OF SUSPENDED SEDIMENT AND CONCENTRATION OF FE, MN, NI, ZN, CU, AND PB IN WATER AND FE, MN, AND PB IN SUSPENDED LOAD OF SELECTED KANSAS

Kansas Univ., Lawrence. Dept. of Geology; and Kansas Univ., Lawrence. Dept. of Civil Engineer-

ing. E. E. Angino, L. M. Magnuson, and T. C. Waugh. Water Resources Research, Vol 10, No 6, p 1187-1191, December 1974. I fig, 3 tab, 13 ref. OWRR A-030-KAN (2), 14-31-0001-3016.

Descriptors: *Suspended load, Streams, Hydrogeology, Geochemistry, Mineralogy.

Group 5B-Sources Of Pollution

Geologic control, Sediment load, *Trace elements, Clay minerals, Quartz, X-ray diffraction, Correlation analysis, Iron, Manganese, Nickel, Zinc, Copper, Lead, *Kansas, Path of pollutants, Pollutant identification.

Identifiers: Arkansas River(Kan), Kansas River(Kan), Prairie Dog Creek(Kan), Little Ar-kansas River(Kan), Walnut River(Kan), Solomon River(Kan), Big Blue River(Kan), Republican River(Kan).

When concentration levels of the elements studied in the suspended sediment were compared to average reported values for shales, they showed Fe to be low. The other elements were higher. Values for these elements in the dissolved portion were variable, reflecting in some cases possibly lithologic differences. The dissolved trace element composition of the water was not reflected in the chemistry of the detrital load. X-ray diffraction study of the mineralogical content of the suspended sediment indicated that montmorillonite was the clay mineral present in all cases. Other minerals present in almost all the samples were calcite and quartz. Gypsum, dolomite, feldspar, illite, and kaolinite were present in lesser amounts in some of the samples. Some question of the source of specific trace elements in these stream waters exists. For Ni and Pb, however, pollution is a possible source. The iron and man-ganese levels in the suspended sediments of all streams were not unusual. Significant correlations of the Pb with Mn and Fe were strongly suggestive of coprecipitation with Fe and Mn oxides. (Visocky-ISWS) W75-05521

TRANSPIRATION DRYING OF SANITARY

Auburn Univ., Ala. Dept. of Civil Engineering. For primary bibliographic entry see Field 5E.

INSTREAM AERATION AND PARAMETERS OF STREAM AND ESTUARINE NITRIFICA-

Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science. For primary bibliographic entry see Field 5A. W75-05530

ENVIRONMENTAL CONTROLS ON GROUND-WATER CHEMISTRY IN NEW MEXICO. I. THE EFFECT OF PHREATOPHYTES,

New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience. For primary bibliographic entry see Field 2D. W75-05531

CHARACTERIZATION OF FRUIT AN VEGETABLE PROCESSING WASTEWATERS, Oregon State Univ., Corvallis. Dept. of Food Science and Technology.

M. R. Soderquist. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 175, \$7.00 in paper copy, \$2.25 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-28, January 31, 1975. 190 p, 34 fig, 46 tab, 11 ref, 6 append. OWRT A-006-ORE(3).

Descriptors: *Food processing industry, *Canneries, *Industrial wastes, *Oregon, Water pollution sources, *Waste identification, *Effluents, Waste water treatment, *Biological

Identifiers: Vegetable processing, processing, Wastewater characterization.

A three-year study of the wastewaters generated in Oregon fruit and vegetable processing plants yielded comprehensive information relating to several major commodities. Characteristics and

volumes of effluents emanating from plants processing sweet corn, red beets, snap beans, Royal Anne cherries, Lambert cherries, Barlett pears and evergreen blackberries were monitored. Wastewaters from the following in-plant unit operations were isolated and monitored: (1) green bean washers, graders, snippers, blanchers, coolers, and clean-up operations; (2) Barlett pear contour peelers, Ewald peelers, brine tanks, trimming lines, rinse tanks, and chopping operations; (3) cherry stemmers, graders and pitters; (4) sweet corn desilkers, blanchers, washers, coolers, flumes, and clean-up operations; and (4) evergreen blackberry crate washers, product washers, and belt washers. The resultant data are presented on both concentration and production bases. Data variations attributable to processing plant dif-ferences, commodity differences, variety differences and equipment design differences are discussed. Next, the amenability of these wastewaters to biological treatment is evaluated. Finally, the expected influence of PL 92-500 on this industry and the relationship of this study to that impact are presented. W75-05534

ANALYSIS OF GROUND-WATER REGIMES BY USE OF NATURAL URANIUM ISOTOPE VARIATIONS, Florida State Univ., Tallahassee. Dept. of Geolo-

gy. For primary bibliographic entry see Field 2F. W75-05535

A CLOSE LOOK AT LONDON'S WATERS, For primary bibliographic entry see Field 5G. W75-05550

TRI-UNIVERSITY REPORT ON THE STATUS OF ENVIRONMENTAL CONTAMINATION BY

Missouri Univ., Rolla.

B. G. Wixson.

In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tennessee, Publ. by U.S. Atomic Energy Commission Office of Information Services, Technical Information Center, Oak Ridge, Tennessee, March, 1974, p 1-5.

Descriptors: *Lead, *Contamination, *Environmental effects, Research and development, Mining, Mills, Air pollution, Toxicity, Conferences, Public Health, *Path of pollutants, Water pollution effects.

The progress of studies of the various aspects of environmental lead by research teams at Colorado State University, The University of Illinois, and the University of Missouri was discussed. The projects dealt with terrestrial, aquatic, and atmospheric dispersion of this toxic substance, as well as with effects of lead mining, milling, and smelting in a previously virgin forest ecosystem. The objectives of this paper were: (1) to integrate recent research findings of the three lead projects, and (2) to evaluate jointly the nature, extent, significance, and strategy for control of contamina tion of the environment by lead. (See also W75-05277) (Jernigan-Vanderbilt)

PROBLEMS WITH MODELING TRANSPORT AND BIOLOGICAL TRANSLOCATION, Colorado State Univ., Fort Collins

E. R. Reiter.

In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tennessee, Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn, March, 1974, p 7-11. 1 fig.

Descriptors: *Model studies, *Analytical techniques, Design, Estimating, Research and development, Testing, Theoretical analysis, *Path of pollutants, Trace elements.

New techniques in constructing environmental models which describe the path of trace metals were discussed. The shortcomings of these box models were considered to be their complexity and limited scope. Most models set the input and out-put automatically at steady-state conditions. The author argues that nature is not stationary nor is it as linear as these restricted models tend to be. The author's personal preference is for simple models which can claim some physical or chemical laws as their foundation, rather than models that include everything but the kitchen sink, yet at the same time leave a wide-open gap of uncertainties and degress of freedom of interpretation. (See also W75-05277) (Jernigan-Vanderbilt) W75-05568

OVERVIEW OF A UNIFIED TRANSPORT

Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div.

M. R. Patterson, J. B. Mankin, and A. A. Brooks. In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tennessee, Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 12-23. 5 fig, 5 ref.

Descriptors: *Model studies, *Computer models, *Trace elements, Toxicity, Biology, Absorption, Computer programs, *Path of pollutants, *Computer models.

A computer model was developed which couples atmospheric deposition of trace contaminants to a hydrologic transport mode. Physical transport, chemical exchange processes, and coupling of toxicant transport to biological uptake and food chain processes are actively being modeled. A brief summary of the programming considerations, coupling of the submodels, and the capabilities of the unified model were presented. A summary of model validation studies was given along with a projection of the modeling effort during the next year. (See also W75-05277) (Jernigan-Vanderbilt) W75-05569

A MULTI-SOURCE ATMOSPHERIC TRANS-PORT MODEL FOR DEPOSITION OF TRACE CONTAMINANTS,

Union Carbide Corp., Oak Ridge, Tenn. Computer Science Div.

M. T. Mills, and M. Reeves.

M. I. Minis, and M. Reeves.

In: Proceedings of the First Annual NSF Trace
Contaminants Conference August 8-10, 1973, Oak
Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn, March,
1974 2 34 24 24 15 and 1985 1974, p 24-36, 3 fig. 9 ref.

Descriptors: *Model studies, *Computer models, *Trace elements, *Depositions(Sediments), Toxicity, Pollutants, Watersheds(Basins), *Path of pollutants, Water pollution sources.

A computer model has been developed to predict the deposition rates within a watershed of toxic materials emitted from different types of sources. At present the following source categories are in-cluded in the model: point (steam plant or incinera-tor), area (city or industrial development), line (auto, rail, or air traffic) and particulate resuspension (windblown mine tailings). The dispersal of pollutants from each of these sources is described in terms of the Gaussian plume model, modified to account for source depletion due to fallout and washout. A seasonal frequency table of wind speed, wind direction, and atmospheric stability together with a plume rise calculation determines the spatial characteristics of the deposition pat-

Sources Of Pollution—Group 5B

tern. The particulate resuspension source strengths also depend upon the wind speed frequency distribution. To simplify the calculation, the area sources, as seen from a given recep-tor gauge, are transformed to equivalent polar areas. After specifying the geographical coor-dinates and strengths of each source, their contributions are summed to give the deposition rate for each pollutant at a particular gauge. (See also W75-05277) (Jernigan-Vanderbilt) W75-05570

PHYSICAL MODELING OF ATMOSPHERIC DIFFUSION,

Colorado State Univ., Fort Collins. Fluid

Mechanics Program.

J. E. Cermak, D. J. Lombardi, and R. S.

In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 37-72, 20 fig. 15 ref.

Descriptors: *Model studies, *Physical properties, *Winds, *Diffusion, *Cities, Pollutants, Meteorology, Topography, Gases, Sampling, Data collections, Analytical techniques, Tracers, *Air pollution, *Path of pollutants.

The use of wind tunnels in modeling the atmospheric boundary layer over urban areas to determine the pollutant transport characteristics was discussed. The effects of city geometry upon contaminant dispersion in city streets was the ob-ject of this particular study. The distribution of pollutant concentrations downwind of a specific source for a range of meteorological conditions in Fort Wayne, Indiana was determined by the construction of a topographical model of the urban features, development of the appropriate ap-proach flow conditions, installation of sources for a tracer gas, sampling of gases over an array of points, analysis of gas samples for tracer concentrations, and measurement of the wind velocities and temperature distributions. This model was then placed in the wind tunnel. Motion in the atheric boundary layer could be simulated with sufficient accuracy to make laboratory studies of air pollutant transport useful for planning air-pollution control measures. Satisfactory agreement between diffusion characteristics in the simulated and real atmosphere has been found whenever field data have been available for making comparisons. (See also W75-05277) (Jerigan-Vanderbilt) W75-05571

ANALYSIS OF CADMIUM PATHS IN ZINC SMELTER OPERATIONS,
Purdue Univ., Lafayette, Ind.
M. B. Triplett, R. H. Spitzer, A. A. B. Pritsker, and

In: Proceedings of the First Annual NSF Trace in: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tennessee, Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 73-88, 5 fig, 2 tab, 2 ref.

Descriptors: *Cadmium, *Zinc, *Model studies, *Analytical techniques, *Industrial wastes, Computer models, *Path of pollutants.

The main purpose of this study was to model the flow of cadmium in zinc-smelting operations. The other two main objectives were: (1) to analyze the model results in order to learn more about the release of cadmium, and (2) to use the model and the analysis of it to design further sampling loca-tions and procedures. The modeling technique used for cadmium flow was the Exclusive - or Graphical Evaluation and Review Technique Program (GERT). The network approach allowed the clear identification of the processes by which cad-

mium is transported throughout smelter operations. The standard GERT computer program was used to obtain estimates of the percentages of the cadmium that would result at the sink nodes of the network. Empirical data concerning cadmium losses were obtained from a zinc company and these data were used to develop the parameters of the network model. The sensitivity of the results of the model to changes in the parameter values was investigated. (See also W75-05277) (Jerigan-W75-05572

MODELING CADMIUM DISCHARGE FROM AN ELECTROPLATING LINE WITH THE GASP IV SIMULATION LANGUAGE,

Purdue Univ., Lafayette, Ind. School of Industrial Engineering.

In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-mission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 89-107, 6 fig. 8 ref.

Descriptors: *Cadmium, *Model studies, Effluents, *Industrial wastes, Pollutants, *Path of pollutants, Computer models, *Computer programs, *Simulation analysis.

A Cd barrel plating line was modeled for the purpose of achieving a greater understanding of the rinsing operation with regard to Cd pollution. A simulation program was developed to serve as a basis for evaluating production and cost aspects of various recovery schemes designed to reduce Cd discharge. The GASP IV simulation language was chosen as the modeling vehicle because of the combined continuous/discrete nature of the process. The general procedure used in modeling the plating line was discussed and an example of the use of GASP IV in evaluating recovery schemes was presented. (See also W75-05277) (Jerigan-Vanderbilt) W75-05573

THE RATE OF MERCURY LOSS FROM CONTAMINATED ESTUARINE SEDIMENTS IN BELLINGHAM BAY, WASHINGTON, Washington Univ., Seattle. Dept. of Oceanog-

M. H. Bothner, and R. Carpenter.

In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974 p 198-210, 5 fig, 18 ref.

Descriptors: *Mercury, *Estuaries, *Sediments, Data collections, Effluents, Oxidation, Laboratory tests, Organic compounds, Inorganic compounds, Toxicity, Trace elements, *Washington, *Path of pollutants.

Identifiers: *Bellingham Bay(Wash).

An estimated 10-20 lbs. of mercury were discharged daily from a chlor-alkali plant at the head of Bellingham Bay, in northern Puget Sound, between 1965 and 1970. Sediment cores collected periodically at the same stations from 1970 until 1973 show that the level of mercury in the sedi-19/3 show that the level of mercury in the sedi-ments is decreasing with time since the high discharge of mercury was stopped. The rate of mercury decrease appears to follow first order kinetics, with a half-life of about 1.3 years, in sedi-ments which are generally oxidizing, with 2-3 per cent carbon and which had initial mercury concentrations of 2-10 ppm. There are a few short-term laboratory experiments in the literature in which the evolution of methylmercury or elemental mercury has been measured under apparently similar conditions. The rates we observe in the field in Bellingham Bay appear to be 2-10 times faster than the rates obtained in the laboratory experiments.

The higher rates observed in the field samples may mean that other forms or processes are important in the loss of mercury. Suggested additional mechanisms are removal of volatile forms of mer-cury with bubbles released from the sediment and/or sediment transport enhanced by benthic or ganisms and wave-induced currents which may resuspend sediment. (See also W75-05277) (Jerigan-Vanderbilt) W75-05578

SOIL AND GROUND-WATER POLLUTANT TRANSPORT MODEL, Union Carbide Corp., Oak Ridge, Tenn. Computer

Sciences Div.

M. Reeves, and J. O. Duguid.

In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 266-272, 4 fig, 5 ref.

Descriptors: *Model studies, *Computer models, *Soils, *Groundwater movement, *Pollutants, Watersheds, Chromium, Seepage, Seepage con-trol, *Path of pollutants.

The transport equations for moisture flow and hydrodynamic dispersion of a dissolved constituent were solved in two dimensions by a finite-element-Galerkin numerical technique. Applications to a small watershed and a seepage pit were presented. Two computer programs were written one for moisture infiltration and redistribution and the other for movement of dissolved material. Finite elements were used for the geometrical assembly, linear Galerkin methods for the spatial in-tegration and Gaussian elimination for solution of the resulting matrix equations. (See also W75-05277) (Jerigan-Vanderbilt)

ANALYSIS OF TRACE METAL BALANCE FOR AQUEOUS SYSTEMS,

Colorado Univ., Denver. Dept. of Biometrics.

F. W. Briese, and R. M. Jorden.
In: Proceedings of the First Annual NSF Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974 p 273-283, 6 fig. 1 tab.

Descriptors: "Molybdenum, "Trace elements, Aquatic environment, "Water pollution, Reser-voirs, Discharge(Water), Potable water, On-site tests, "Colorado, Path of pollutants. Identifiers: *Dillon Reservoir(Colo).

A mass balance for molybdenum inputs-outputs around Dillon Reservoir, Colorado was estimated for the period from November, 1971 to November, 1972. A unique characteristic of this system is the annual single-pulse input resulting from man-reannual single-puse input residual from manie-lated activities. The estimated flux is 250,000 pounds per year. The sensitivity of the flux esti-mates to measurement errors in volumetric flow rate and mass concentration was examined to put in perspective the apparent error of closure. On November 9, 1971, Dillon Reservoir contained 181,200 pounds of molybdeum in solution. Between that time and November 12, 1972, 252,700 pounds of molybdenum entered the reservoir, primarily during May and June, 1972 from Ten-Mile Creek. This massive slug input during the spring runoff resulted from the need to discharge waters from the tailings ponds of Climax Methods and Company in order to varied work. Molybdenum Company in order to avoid washout. The flow of some 250,000 pounds molybdenum through the reservoir masked the apparent internal cycling which was indicated in 1970. For 1971-1972 the indication from this study is that 43,200-12,100 = 30,100 pounds of molybdenum entered the reservoir by release from bottom sediments. (See alwo W75-05277) (Jernigan-Vanderbilt)

Group 5B-Sources Of Pollution

COMPUTER MODEL FOR CHEMICAL EXCHANGE IN THE STREAM SYSTEM, Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div.

R. J. Raridon, M. T. Mills, and J. W. Huckabee. In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-mission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 284-291, 4 fig, 5 ref.

Descriptors: *Model studies, *Computer models, *Streams, Chemicals, *Mercury, Trace elements, Toxicity, Sorption, Laboratory Watersheds(Basins), Tracers, *Tennessee. Identifiers: Walker Branch watershed(Tenn).

A computer model for chemical exchange was developed in order to trace the flow of toxic con-taminants downstream from the point of injection. The model was similar to that developed at the University of Texas, but was modified to give a more complete and realistic treatment of the sorption-desorption mechanism. In addition, the model was able to treat variations in stream velocity and exchange parameters as a function of distance downstream. The model was validated using data from a mrcury stream tagging experiment on the Walker Branch watershed at ORNL. (See also W75-05277) (Jerigan-Vanderbilt) W75-05583

MODELING ATMOSPHERIC DISPERSION OF LEAD FROM AUTOMOTIVE SOURCES, Colorado State Univ., Fort Collins. Dept. of At-

mospheric Science. P. C. Katen.

In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-mission, Office of Information Services, Techni-cal Information Center, Oak Ridge, Tenn., March, 1974, p 298-313, 9 fig, 9 ref.

Descriptors: *Model studies, *Lead, *On-site data collections, *Air pollution, Filters, Analytical techniques, Particle size, *Path of pollutants, *Pollutant identification.

Several experimental programs were conducted for the purpose of studying and parameterizing the atmospheric transport of lead from atmospheric sources. Short-range diffusion from an isolated, divided highway was described with a Gaussian plume model, and evaluated by a scheme to account for vertical wind profiles, yielding a non-Gaussian vertical concentration profile. Several of the modeling problems for particulate diffusion were discussed. An extensive field program was conducted to measure vertical lead concentration in a city street caynon. A sampling network of 19 stations was established in and around Fort Collins, Colorado, covering an area of 120 sq km. Graphite emission spectrometer cups were used as the filtering media, with filters being changes three times daily. Simple diffusion models were complicated by having to estimate source strengths and particulate settling. The results showed some very strong vertical concentration gradients and complex flow patterns which vary significantly with wind direction. (See also W75-05277) (Jerigan-Vanderbilt) W75-05584

NORMALIZATION AND INTERPRETATION OF ATMOSPHERIC TRACE ELEMENT CON-CENTRATION PATTERNS, Maryland Univ., College Park. Dept. of Chemis-

G. E. Gordon, and W. H. Zoller. In: Proceedings of the First Annual NSF Trace in: Proceedings of the Pist Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-mission, Office of Information Services, Techni-cal Information Center, Oak Ridge, Tenn., March, 1974, p 314-325, 4 fig, 12 ref.

Descriptors: *Trace elements, *Atmosphere, *Air pollution, *Data collections, Particle size, Alu-minum, Laboratory tests, Testing procedures, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Standards, Zinc, Arsenic compounds, Lead Mercury, *Path of pollutants.

A double normalization of elemental concentration patterns, consisting of normalization to a major non-volatile element and then to its crustal abundance patterns, was discussed. This procedure revealed large enrichments of some elements in atmosphere relative to the crustal pattern. The authors suggested that possible sources of these enriched elements could be identified by performing similar normalizations of elemental con-centrations in particles released by major air pollu-tion activities. The enrichment factors for the following sources were given: (1) elements on parti-cles collected in the atmospheres of Boston, northwest Indiana, and San Francisco; (2) municipal incinerator fly ash and the EPA-NBS coal standard; (3) coal and suspended particles in the stacks of coal-fired power plants; and (4) the EPA-NBS standard fuel oil. (See also W75-05277) (Jerigan-Vanderbilt) W75-05585

MODELING OF PARTICULATES IN GARY, IN-DIANA AREA, Battelle Columbus Labs., Ohio.

T. J. Thomas, and W. J. Davis. In: Proceedings of the First Annual NSF Trace an: Proceedings of the Pirst Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-mission, Office of Information Services, Techni-cal Information Center, Oak Ridge, Tenn., March, 1974, p 326-350, 11 fig, 1 tab, 4 ref. NSF (GI-35106).

Descriptors: *Model studies, *Cadmium, *Air pollution, *Lakes, Gases, Pollutants, Data collections, *Lake Michigan, *Indiana, Winds, *Path of pollutants. Identifiers: Gary(Ind).

A transport model for the airborne transport of cadmium was developed for the Gary region. The model included the effects of Lake Michigan and dustfall. For this study an upgraded version of the Air Quality Display Model was used. The adaptations of AQDM included the addition of dustfall equations to model particulate settling and mass depletion of the plume and the addition of a curvilinear wind field to account for lake breezes. Preliminary results of the model, using total par-ticulates as the pollutant, demonstrated that dust-fall is a highly important consideration, very probably accounting for the calibration slope necessary, but unexplainable, in transport models that treat particulates as a gas. The effects of Lake Michigan previously assumed to be large, were quite the opposite. The effects of a lake breeze must be essentially self-canceling. (See also W75-05372) (Jersing Woodshill) 05277) (Jernigan-Vanderbilt) W75-05586

THE PORE WATER CHEMISTRY OF RECENT SEDIMENTS IN THE WESTERN MEDITER-RANEAN BASIN,

Institut de Physique de Globe, Paris (France). G. Michard, T. M. Church, and M. Bernat. Journal of Geophysical Research, Vol 79, No 6, p 817-824, February, 1974. 8 fig, 3 tab, 37 ref.

Descriptors: *Sediments, *Magnesium, *Calcium, *Pore water, *Diffusion, Ions, Sampling, Sea water, Analytical techniques, Spectroscopy, Onsite data collections, Sedimentation rates, Movement, Water pollution sources.
Identifiers: *Mediterranean Basin(Western area).

A 9-m core was recovered from sediments overlying a salt dome in the western Mediterranean basin (2560 m) and was found to have marked pore water gradients of alkaline-earth metals and sulphate ions, and an unsupported Th-230 sedimentation rate of 8cm/1000 yr. The increasing concentrations of interstitial Mg, Ca, Sr, and Ba ions (without marked variation in Na, K, and Cl ions) probably arise from mobilization of constituents in the un-derlying evaporites and subsequent diffusion and reaction in the overlying sediment column. The magnesium, strontium, and to some extent calci-um concentration gradients can be described as a model of interstitial diffusion without reaction and apparent coefficients of the minus 7th power sq cm/s, whereas barium and probably calcium ions are regulated by both diffusion and solubility reactions with the barite and calcite phases. Interstitial sulphate decreased monotonically owing to bacterial organic reduction and at depth the sulphate and barium ion activity product is in saturated equiliium with barite. (Jernigan-Vanderbilt) W75-05587

REMOVAL OF CATIONS FROM LEACHATE BY INTERACTION WITH SUBSURFACE SOILS,

Environmental Protection Agency, Boston, Mass. Solid Waste Management Branch.
For primary bibliographic entry see Field 5G.
W75-05589

EFFECTS OF STRIP MINING ON THE HYDROLOGY OF SMALL MOUNTAIN WATERSHEDS IN APPALACHIA, Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4C. W75-05593

ENDRIN IN FOREST STREAMS AFTER AERI-SEEDING WITH ENDRIN-COATED

DOUGLAS-FIR SEED,
Forest Service (USDA). Corvallis Oreg. Pacific
Northwest Forest and Range Experiment Station.
D. G. Moore, J. D. Hall, and W. L. Hug. Research Note, PNW 219, 1974. 14 p, 1 fig, 2 tab, 22 ref. PNW-1602.

Descriptors: *Repellents, *Animal control, *Water quality, *Endrin, *Planting management, *Douglas fir trees, Water pollution sources, *Pesticide residues.

Extent and duration of endrin contamination in streamwater were determined after aerial seeding of two western Oregon watersheds with treated Douglas-fir seed. Detectable residues of endrin were found in a steep gradient stream for a period of less than 5 hours and in a slower flowing stream for 11 days. Endrin was again detected in the low gradient stream during the high flow of a winter storm 23 days after seeding. Maximum concentrations measured were well below reported 96-hour median tolerance limits for important fish species. (Forest Service) W75-05602

EFFECTS OF SURFACE IRRIGATION WITH DAIRY MANURE SLURRIES ON THE QUALI-TY OF GROUNDWATER AND SURFACE RU-

Tennessee Univ., Knoxville. Dept. of Agricultural

Engineering. J. C. Barker, and J. Sewell.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 4, p 804-807, July-August, 1973. 1 fig, 4 tab, 9 ref. OWRT A-021-TN(5).

Descriptors: *Irrigation, *Dairy industry, *Farm wastes, *Slurries, *Water quality, Groundwater, Surface runoff, Bacteria, Nitrates, Water pollution sources, *Path of pollutants, Pollutant identification, Dissolved solids.

The major objectives were to determine the effects of slurry irrigation on surface runoff and

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groundwater quality and to develop techniques for irrigating with dairy manure slurry. One acre of concrete lot, loafing area, and building roofs at a dairy with about 125 milking cows was served by a slurry irrigation system where manure slurry, rainfall runoff, and wastewater were collected into drains and delivered by gravity flow into a 75,000 gallon concrete storage tank. The slurry was delivered through 4-in. portable aluminum irriga-tion pipeline to the field sprinkler. Grab samples of surface and groundwater were collected and analyses were made for bacteria, biochemical ox-ygen demand, dissolved solids content, nitrate nitrogen, orthophosphate, chloride, and residues. All median surface runoff nitrate nitrogen concentrations were within the permissible criteria for raw water for public supplies. All surface runoff chloride concentrations were well within the per-missible criteria. The dissolved solids content of the manure-saturated surface runoff generally exceeded acceptable standards. The coliform teria concentrations for the surface runoff from both the manure-saturated and the conventional pasture exceeded the standard. (Cartmell-East Central) W75-05606

CHEMICAL HYDROGEOLOGY OF THE CAR-BONATE PENINSULAS OF FLORIDA AND YU-CATAN.

Nevada Univ., Reno. For primary bibliographic entry see Field 2F. W75-05614

CHANGES IN CONCENTRATION OF CERTAIN CONSTITUENTS OF TREATED WASTE WATER DURING MOVEMENT THROUGH THE MAGOTHY AQUIFER, BAY PARK, NEW

Geological Survey, Mineola, N.Y. Geological Survey, Mineola, N.Y.
I. F. H. Ku, J. Vecchioli, and S. E. Ragone.
Available from the Superintendent of Documents
GOP, Washington, DC 20402, \$3.15. Journal of
Research of the US Geological Survey, Vol 3, No
1, p 89-92, January-February 1975. 2 fig, 2 tab, 12

Descriptors: *Path of pollutants, *Waste disposal wells, *Artificial recharge, *Groundwater movement, *New York, Aquifers, Waste water treatment, Water reuse, Tertiary treatment, Injection Identifiers: *Long Island(NY).

Approximately 7 million gallons of tertiary-treated sewage (reclaimed water) was injected by well into the Magothy aquifer, Long Island, New York, and was subsequently pumped out. As the reclaimed water moved through the aquifer, concentrations of certain dissolved constituents decreased: total on vertain dissolved constituents decreased: total nitrogen, 7 percent; methylene blue active substances, 49 percent; chemical oxygen demand, 50 percent; and phosphate, more than 93 percent. (Knapp-USGS) W75-05625

MOBILIZATION OF IRON IN WATER IN THE

MOBILIZATION OF IRON IN WATER IN THE MAGOTHY AQUIFER DURING LONG-TERM RECHARGE WITH TERTIARY-TREATED SEWAGE, BAY PARK, NEW YORK, Geological Survey, Mineola, N.Y. S. E. Ragone, H. F. H. Ku, and J. Vecchioli. Available from the Superintendent of Documents, GPO Washington, DC 20402, \$3.15. Journal of Research of the US Geological Survey, Vol 3, No 1, p 93-98, January-February 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Water pollution sources, *Iron, *Pyrite, *Waste disposal wells, *New York, Tertiary treatment, Water chemistry, Artificial recharge, Aquifers, *Path of pollutants, Injection wells, Groundwater movement, Water reuse. Identifiers: *Long Island(NY).

Tertiary-treated sewage (reclaimed water) has been recharged by well into the Magothy aquifer at Bay Park, N.Y., intermittently since 1968. The longest of 13 recharge tests lasted 84.5 days. This was sufficient time for the reclaimed water to reach and observation well 200 ft from the recharge well. Although the iron concentrations of the reclaimed water and the native water were less than 0.4 mg/litre, the iron concentrations of samples from nagrate, the fron concentrations of samples from observation wells 20, 100, and 200 ft from the recharge well at times approached 3 mg/litre. Source of the iron is pyrite that is native to the aquifer. (Knapp-USGS) W75-05626

WATER-QUALITY CHANGES DURING A SAL-MON RUN IN AN INTERIOR ALASKAN STREAM,

Geological Survey, Anchorage, Alaska.

J. W. Nauman, and D. R. Kernodle.

Available from the Superintendent of Documents,
GPO Washington, DC 20402, \$3.15. Journal of
Research of the US Geological Survey, Vol 3, No
1, p 103-106, January-February 1975. 2 fig, 1 tab,

Descriptors: *Water quality, *Salmon, *Alaska, Turbidity, Dissolved oxygen, Fish, Carbon diox-ide, Chlorophyll, Invertebrates, Littoral drift. Identifiers: *Fish Creek(Alaska).

Increased activity at sunset of sockeye (red) salmon (Oncorhynchus nerka) in an Alaskan stream resulted in increases in carbon dioxide, turbidity, suspended chlorophyll, and drift invertebrates, and a decrease in pH and dissolved oxygen. Some of the water-quality changes occurring on Fish Creek near sunset were as great as measured seasonal changes. (Knapp-USGS) W75-05628

PYRROLIDONE-A NEW SOLVENT FOR THE METHYLATION OF HUMIC ACID, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 5A. W75-05631

CHEMICAL AND PHYSICAL DATA FOR DISPOSAL WELLS, EASTERN SNAKE RIVER PLAIN, IDAHO,

Geological Survey, Boise, Idaho. R. L. Whitehead.

Idaho Department of Water Resources Boise, Water Information Bulletin No 39, October 1974. 31 p, 8 fig, 7 tab, 13 ref.

Descriptors: *Waste disposal wells, *Idaho, *Water quality, *Water pollution sources, Return flow, Artificial recharge, Irrigation water, Pesti-

Identifiers: *Snake River Plain(Idaho).

From May 1972 to April 1973, 119 disposal wells on the eastern Snake River Plain, Idaho, were stu-died. Depths of the disposal wells ranged from 35 to 488 feet and averaged 102 feet. Most of these wells were so shallow as to not extend to the un-derlying water table. Flow rates into the wells ranged from less than 0.01 to 3.7 cubic feet per second and averaged about 0.48 cfs. Water sam-ples were collected from 55 irrigation-disposal wells, 14 city-street drain wells, 5 canals, 1 diver-sion ditch, 2 sites, on the Snake River, and 1 domestic well. Of four samples analyzed for pesticides, two contained detectable concentrations of some constituents. One of these samples contained traces (0.01 to 0.04 microgram per liter) of DDE, DDT, dieldrin, chlordane, diazinon, and silvex, as well as 0.26 microgram per liter of 2,4-D; the other sample contained 0.01 and 0.02 microgram per liter of DDT and DDE respectively. Oil and grease concentrations in 10 city-street drain samples ranged from 11 to 4,000 milligrams per liter and dissolved-lead concentrations ranged from 19 to 1,600 micrograms per liter. One sample

of irrigation-runoff water contained 4 milligrams per liter of oil and grease and less than 100 micro-grams per liter of dissolved lead. Analyses of water samples from irrigation-disposal wells and city-street drains showed a wide range of values for sediment, turbidity, total and fecal coliform bacteria, and fecal streptococci bacteria. (Knapp-USGS) W75-05632

EVALUATION OF HYDRAULIC CHARAC-TERISTICS OF A DEEP ARTESIAN AQUIFER FROM NATURAL WATER-LEVEL FLUCTUA-TIONS, MIAMI, FLORIDA,

Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 2F. W75-05633

CHEMICAL AND BIOLOGICAL CONDITIONS OF LAKE OKEECHOBEE, FLORIDA, 1969-72, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5C. W75-05634

WATER-QUALITY DATA OF THE SACRA-MENTO RIVER, CALIFORNIA, MAY 1972 TO APRIL 1973, Geological Survey, Menlo Park, Calif.

For primary bibliographic entry see Field 5A. W75-05635

SIMULATED EFFECTS OF OIL-SHALE DEVELOPMENT ON THE HYDROLOGY DEVELOPMENT ON THE PICEANCE BASIN, COLORADO, Geological Survey, Reston, Va. For primary bibliographic entry see Field 4C. W75-05637

MID-1971 GROUND-WATER CONDITIONS AT YANKEETOWN WELL FIELD, LEVY COUN-TY, FLORIDA,

Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 2F. W75-05649

THE SCAVENGING OF SILVER BY MAN-GANESE AND IRON OXIDES IN STREAM SEDIMENTS COLLECTED FROM TWO DRAINAGE AREAS OF COLORADO, Geological Survey, Denver, Colo.

For primary bibliographic entry see Field 2J. W75-05652

PESTICIDES IN SELECTED WESTERN STREAMS--1968-71, Geological Survey, Austin, Tex. Water Resources

For primary bibliographic entry see Field 5A. W75-05653

CHEMICAL INTERACTION DURING DEEP WELL RECHARGE, BAY PARK, NEW YORK, Geological Survey, Mineola, N.Y. Water Resources Div.

S. E. Ragone, and J. Vecchioli. Ground Water, Vol 13, No 1, p 17-24, January-February 1975. 7 fig, 3 tab, 14 ref.

Descriptors: *Path of pollutants, *Artificial recharge, *New York, *Waste disposal wells, Iron, Injection wells, Water chemistry, Water quality, Water pollution sources, Ion exchange. Identifiers: *Long Island(NY).

Tertiary-treated sewage (reclaimed water) was recharged into the Magothy aquifer in 13 recharge experiments in Long Island, N. Y., between 1968 and 1973. The recharge resulted in a degradation in water quality with respect to iron concentration and pH. Iron concentration increased from the

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range 0.14 to 0.30 milligrams per litre to as much as 3 mg per litre at the 20-, 100-, and 200-foot or 6.1-, 30-, and 61-metre observation wells as the reclaimed water displaced native water. The increase was probably a result of pyrite dissolution. The pH of the water decreased from the range 5.22 to 5.72 to a low of about 4.50, predominantly as a result of cation-exchange reactions. (Knapp-USGS)

W75-05656

TRANSVERSE MIXING OF HEATED EF-

FLUENTS IN OPEN-CHANNEL FLOW,
State Univ. of Iowa, Iowa City. Dept. of
Mechanics and Hydraulics. T-P. Yeh

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 302, \$7.00 in paper copy, \$2.25 in microfiche. PhD thesis, May 1974. 180 p. 38 fig, 2 tab, 28 ref, 2 append. OWRT A-040-1A(4) and C-3140(No. 3692)(1).

Descriptors: *Open channel flow, *Energy equa-Descriptors: "Open channel flow, "Energy educ-tion, "Laboratory tests, "Thermal pollution, "Distribution, Mixing, Analysis, Temperature, Velocity, Turbulence, Vortices, Profiles, Froude number, Diffusion, Statistics, Heat budget, Heat transfer, Hydraulics. Identifiers: Buoyancy.

Laboratory flume experiments covered a range of flows from rapidly mixing to nearly stratified. heated effluent was introduced continuously into the flume from a source located at either the centerline or one side. Temperature distributions were measured at several cross sections. For selected flow conditions, velocity profiles of longitudinal and lateral components were also measured. Results showed that the mixing process was related to the development and decay of buoyancygenerated secondary flow. This secondary flow was the dominant mechanism in the near field. where the transverse temperature distribution was commonly bimodal. In the far field region, transverse mixing was mainly due to turbulent diffusion. Analyses showed that the influence of buoyancy on the transverse mixing process could be described in terms of the excess mean, absolute transverse displacement from the source, the excess variance, and the distance between the two modes. These parameters were related to each other and to an initial densimetric Froude number based on the shear velocity. Computed predictions of transverse profiles of depth-averaged temperature based on these relationships gave good agree-ment with experimental results. A finite-difference representation of the three-dimensional, steadystate convection-diffusion equation was solved numerically. The buoyancy-induced secondary circulation was simulated by a vortex function. For selected experiments, reasonable agreement between computed and experimental temperature profiles was found. (Adams-ISWS) W75-05657

THE WATER QUALITY AND BOTTOM SEDI-MENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,

Rutgers - the State Univ., New Brunswick, N.J. Dept. of Soils and Crops.

E. H. Thurlow.

Available from the National Technical Informa-Avanaoie from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 281, \$10.00 in paper copy, \$2.25 in microfiche. Doctoral Thesis, 344 p, 18 fig, 101 tab, 3 append. OWRT B-040-NJ(4), 14-31-0001-3614.

Descriptors: *Wetlands, *Lagoons, *Water quality, *Bottom sediments, Baseline studies, Water pollution sources, *New Jersey, Nitrogen com-pounds, Cations, Organic matter, Heavy metals, Ammonium compounds, Phosphates, Chlorides,

A study was conducted in four lagoon systems located in Ocean County, New Jersey, to determine both water quality and bottom sediment characteristics in these systems. Depth was found to have a major influence on water quality. The shallowest area of a lagoon system is usually at the mouth with increasing depth toward remote points. Lagoon systems are generally deeper than the adjacent bay creating a 'sill-effect' which hinders the exchange of water between the two. Accumulations of NH4(N), NO3(N), NO2(N), PO4, Cl, SO4 and some heavy metals, especially Fe, Mn, Pb and Cu, were found in excessively deep areas of lagoon systems. Anaerobic conditions were also present in these waters. Also, the lagoon waters contained higher concentrations of NH4(N), NO2(N) and PO4 than adjacent bay waters. Lagoon sediments were found to be black mucks having a strong odor of H2S. The sediments were generally high in organic matter content, total N content, CEC and exchangeable cations. The sediments in the lagoons were higher in organic matter content than the adjacent bay sediments. (Nieswand-Rutgers)

NITRIFICATION EFFECTS IN WASTE TREAT-

MENT PROCESSES, Rutgers - the State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5D.

PHOTOSYNTHETIC REAERATION IN THE UPPER PASSAIC RIVER, Rutgers - the State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
T.J. Tuffey.
Master Thesis, January 1972. 146 p, 3 append. OWRT B-010-NJ (2).

Descriptors: *Photosynthesis, *Biochemical oxygen demand, "Eutrophication, "Photosynthetic oxygen, Water quality, Nutrients, Water pollution sources, "New Jersey, "Reaeration. Identifiers: "Passaic River(NJ).

Investigations were made of photosynthesis upon a small polluted river, the Passaic River in New Jersey, including effects upon the general oxygen regimen of the river. Data obtained showed variation of photosynthesic oxygen with water depth, time of day, and with the seasons. Attempts were made to develop a method of mathematically modelling net photosynthesis effect based on water quality and environmental characteristics; but results were not sufficiently satisfactory to be definitive. A comparison of oxygenation effects due to photosynthesis and the natural atmospheric reaeration, respectively, showed that photosynthesis contributed about 20% of the total oxygen added; the proportion being independent of the stream discharge. Moreover, if the dissolved oxygen concentration of the river were at a higher level this proportion would rise, up to possibly 45% of the total. Nutrient levels in the water were high. The phosphate levels in particu-lar were many times that necessary to maintain algae growth. W75-05662

DISTRIBUTION OF AUTOTROPHIC NITRIFY-ING BACTERIA IN THE PASSAIC RIVER, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.

V. A. Matulewich. Available from the National Technical Informa tion Service, Springfield, Va. 22161, as, PB-240 292, \$7.00 in paper copy, \$2.25 in microfiche. M.S. Thesis, October 1974. 181 p, 21 fig, 27 tab, 120 ref, append. OWRT A-030-NJ(3). 14-01-0001-3230.

Descriptors: *Nitrification, *Water pollution ef-*Microbial degradation, Environmental effects, Nitrates, Microorganisms, Oxygen demand, *New Jersey, Ecology, Distribution patterns, *Path of pollutants.

Identifiers: *Nitrosomonas, *Nitrobacter. *Nitrogenous oxygen demand, *Nitrifying bac-teria, *Passaic River(NJ), Environmental surteria. faces, Microbial ecology.

The nitrogenous oxygen demand exerted by sewage and secondarily treated effluent may seriously lower the water quality of receiving streams. Comprehensive stream management requires the ability to predict where this component of the oxygen demand will be exerted, and at what rate. Efforts to include nitrification in stream models are unlikely to be highly successful without some understanding of the ecology of the responsible organisms. This investigation was undertaken to provide such information. The distribution of nitrifying bacteria in bulk waters, on surfaces, and in muds at 11 Passaic River sites was studied using most-probably-number procedures. In mud samples taken from the mud-water interface, nitrifiers were from 21 to 140,000 (average 515) times more abundant (volumetrically) than in the overlying waters. Nitrifiers were found throughout a 21 cm profile of mud, the highest densities occuring in the topmost levels. Large numbers of these bacteria were associated with aquatic plants, algae, and slimes on rocks. There was no correlation between nitrifier density and river flow. Ammonium-oxidizers outnumbered nitrite-oxidizers in all but one of the 112 samples examined by a factor from 1.7 to 5310 (average 20.9). These data suggest that high river velocities may bring into suspension substantial numbers of nitrifiers. The relative scarcity of nitrifying bacteria in bulk waters and their abundance at surfaces is suggestive that surfaces may be the more important site of nitrification in rivers. (Whipple-Rutgers) W75-05663

TAR POLLUTION SURVEY AT GOLDEN

BEACH, FLORIDA, Coast Guard, Goton, Conn. Research and Development Center.

M. Curtis, and W. Saner. Available from the National Technical Information Service, Springfield, Va. 22161, as AD-786 632, \$3.75 in paper copy, \$2.25 in microfiche. Report No. CG-D-3-75, May 1974. 25 p, 6 fig, 3 tab, 7 ref, 4 append.

Descriptors: *Oil pollution, *Sampling, Beaches, Surveys, Seashores, Winds, *Florida. Identifiers: *Tar pollution, Tar deposition, Golden Beach(Fla).

A beach area on the southeast Florida coast was systematically sampled in order to measure ambient levels of coastal tar pollution, to evaluate the effect of sampling zones of varying sizes, and to determine the effect of tar buildup on the beach with time. In addition, the effect of wind on tar deposition was also determined. Results demonstrate that a sampling zone as small as 20 feet in length produced tar loading data as reliable as a zone 160 feet in length. There was a proportionately heavier deposition of tar on the most northerly situated zones whenever the wind blew from either east or west. This disproportionate tar deposition was not effected, however, until 24 hours later. A southerly wind, on the other hand, caused no disproportionate tar stranding. Most tar came ashore whenever the wind blew from the northeast during the 24-hour periods prior to sam-pling. The beach time constant, that is, the time ssary for the beach to accumulate 50% of the maximum amount of tar it will carry at infinite time (having started with an initially tar-free beach) was calculated to be 14.3 hours; the ultimate tar load was 1073 gm tar per 100 linear feet of beach. Twenty-one samplings generated an inac-curate average tar density on the beach, whereas 35 samplings produced an accurate average tar loading value. (Sims-ISWS)

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A TECHNIQUE FOR PREDICTING THE MOVE-MENT OF OIL SPILLS IN NEW YORK HAR-BOR, Coast Guard, Groton, Conn. Research and

Development Center. I M Lissauer.

Available from the National Technical Information Service, Springfield, Va. 22161, as AD-786 627, \$4.25 in paper copy, \$2.25 in microfiche. Report No CG-D-6-75, February 1974. 53 p, 19 fig, 16 tab, 5 ref, 2 append.

Descriptors: *Oil spills, *Oil pollution, *Forecasting, Boundaries(Surfaces), New York, On-site data collections, Movement, Hudson River, Freshwater, Flow, Winds, Tides. Identifiers: Oil transport, *New York Harbor.

The major factors involved in the transport of an oil slick in New York Bay are winds, tides, and freshwater flow from the Hudson River. Computations were made to quantify the effect of each of these factors on the movement of an oil slick. Quantification of each effect resulted in a simple method of forecasting the movement of an oil slick within the harbor. In addition, a method of predicting the boundaries within which a slick is most likely to move was presented. Extensive tabula-tions of the experimental data were contained in an appendix. (Sims-ISWS) W75-05668

EVALUATION TEST OF A SMALL HARBOR

OIL SPILL RETRIEVAL SYSTEM, Harding Pollution Control Corp., West Hemp-stead, N.Y.

D. J. Graham, and L. Somers.

Available from the National Technical Information Service, Springfield, Va. 22161, as AD-782 567, \$3.75 in paper copy, \$2.25 in microfiche. July 1974. 32 p, 23 fig, 3 tab. N00024-73-C-0273.

Descriptors: *Oil spills, *Oil pollution, Harbors, Separation techniques, Evaluation, *Testing, Har-

Identifiers: Oil spill retrieval, Oil spill cleanup.

An evaluation test was conducted to obtain per-formance data and develop an acceptance test procedure for a small oil spill retrieval system requiring no more than two men for its deployment and operation. The use of a simple, floating gravity separator provides a 6.8 to 1 reduction in fluid volume recovered by the simple weir-type SLURP skimmer. This reduction of oil-water volume allows the use of a compact, collapsible, 300-gallon lows the use of a compact, conspande, Sociation storage bag in the bed of a standard 3/4 ton pickup truck for recovery of small harbor oil spills. The present combination of a SLURP skimmer, single diaphram pump, floating separator, and collapsible storage bag can be effectively deployed by two men from a single pickup truck. A reproducible test procedure was delineated for use as a first article acceptance test for this type of equipment. (Sims-ISWS) W75-05669

A QUANTITATIVE AND QUALITATIVE SUR-VEY OF OILS AND TARS STRANDED ON GAL-VESTON ISLAND BEACHES, Texas A and M Univ., Galveston. Center for

Marine Resources. For primary bibliographic entry see Field 5A. W75-05681

MANGANESE NODULES (II): PROSPECTS FOR DEEP SEA MINING,

A. L. Hammond. Science, Vol 183, No 4125, p 644-646, February 15, 1974. 1 fig.

Descriptors: *Mining, *Mining wastes, *Manganese, *Oceans, Sediments, Water pollution, Metals, Copper, Nickel, Cobalt. Identifiers: Ocean mining.

The feasibility of deep sea mining of manganese, nickel, copper, and cobalt is being studied by several industrial and governmental groups. Several systems for recovering the ore nodules from the ocean floor are being tested. Usual physical means and smelting have not proved successful for separating the metals. Chemical separation methods being investigated in industry are discussed. Environmental concerns include the distribution of sediment particles - some of which may remain suspended for a year- throughout the water column. Also second-generation processing plants may be built to operate at sea, where disposal of millions of tons of residues that contain manganese and other toxic metals in oxide form will be a problem. (Pulliam-Vanderbilt) W75-05690

ORIGIN OF METALLIFEROUS SEDIMENTS FROM THE PACIFIC OCEAN. Oregon State Univ., Corvallis. School of Oceanog-

For primary bibliographic entry see Field 2J. W75-05701

CADMIUM IN PLANTS, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 2I. W75-05709

MERCURY, CADMIUM, AND CHROMIUM IN THE NETHERLANDS, (LE MERCURE, LE CADMIUM ET LE CHROME AUX PAYS-BAS), Central Lab. TNO, Delft (Netherlands). W H I M Wientiens

Report No EUR 5006 F, Commission des Communautes Europeennes. (1973). 29 p, 11 tab, 1 fig, 47

Descriptors: *Mercury, *Cadmium, *Chromium, Heavy metals, Import, Export, Industrial production, Environment, Environmental effects. Identifiers: *Netherlands.

At the request of the Commission of European Communities, data were collected on the use in the Netherlands of mercury, cadmium, and chromium, as well as their derivatives. Presented are: (1) import and export figures; (2) areas of use, and (3) the presence of these metals in the environment. Also included are data that were considered of interest from other countries. For mercury, which plays a large role in the Netherlands, the data were mostly gathered from the quantitative domain. The data from different sources appeared very divergent at times. Cadmium was of less importance but on the increase, in the Netherlands. From a qualitative viewpoint, the status of this metal was somewhat clarified, but the quantitative data were inadequate. The data confirmed that there was lit-tle interest in chromium at that time. (Pulliam-Van-W75-05710

WATERSHED VALUES IMPORTANT IN LAND USE PLANNING ON SOUTHERN FORESTS, Forest Service (USDA), Franklin, N.C. Coweeta For primary bibliographic entry see Field 4D. W75-05716

TERS (CONCEPTO DE POLUCE PARAMETROS A DETERMINAR), For primary bibliographic entry see Field 5C. W75-05725 DETERMINATION OF POLLUTION PARAME-POLUCION.

DERIVATION OF A THREE DIMENSIONAL NUMERICAL WATER QUALITY MODEL FOR ESTUARY AND CONTINENTAL SHELF APPLI-

CATION, National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.

M. Spaulding.

Available from the National Technical Information Service, Springfield Va, 22161, as N74-20974, \$3.25 in paper copy, \$2.25 in microfiche. NASA TM X-71930 (Undated). 22 p. 3 fig, 28 ref.

*Hydrologic equation. Descriptors: *Mathematical models, *Water quality, Estuaries, Continental shelf, *Mass, Waste Estuaries, Continental shelf, Waste water(Pollution), Numerical analysis, Advection, Hydrodynamics, Degradation(Decomposition), Dispersion. Identifiers: *Mass transport model.

One-dimensional approximations normally assume that the vertical and cross stream structure of a given water quality parameter is of secondary importance while the main axis of flow directions is of primary interest. Two-dimensional models eliminate either the vertical or lateral structure while maintaining the other two. This integral or averaging approach has normally been taken, since, as spatial dimension numbers increase, computational difficulties, and computer time and storage requirements to solve the resulting equa-tions, increase markedly. There are regions where a useful representation of the actual water quality distribution can only be obtained from a three-dimensional picture. A derivation is given for a three-dimensional mass transport equation, ap-propriate for numerical modeling of estuary and continental shelf water quality variations for both time dependent and steady state cases. A stable and accurate finite differences approximation to the derived equation is presented an a solution scheme for the resulting equations outlined. Preliminary results are obtained using the model for extremely simple problems which have analytical solutions. Results indicate that the numerical model as presented will provide a fruitful scheme to study water quality problems in coastal waters for both steady state and time dependent cases. (Jones-Wisconsin) W75-05738

RUNOFF WATER QUALITY OF THREE TUC-SON WATERSHEDS.

Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics. For primary bibliographic entry see Field 4C. W75-05768

COMBINED BUOYANCY AND BOUNDARY EF-FECTS ON THE TRAJECTORY OF A TWO-DIMENSIONAL JET,

Connecticut Univ., Storrs.

M. H. Stenhouse. Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 475, 86.25 in paper copy, \$2.25 in microfiche. Ph.D. Dissertation, 1974. 146 p, 2 tab, 45 fig, 2 append, 23 ref. OWRT A-050-CONN(4). 14-31-0001-3507.

Descriptors: *Hydrodynamics, *Flow system, Jets, *Buoyancy, *Thermal pollution, Reynolds number, Aquiculture, *Boundaries(Surfaces).
Identifiers: *Two-dimensional jets, Boundary effects. Interiority of the property of fects, Jet trajectory, Recirculation region, Waste heat disposal.

New experimental data on a two-dimensional jet issuing parallel to an offset surface are presented. The experimental results are used as the basis for an analytical method to predict the jet centerline trajectory, reattachment point, recirculation re-gion pressure distribution, and offset surface pressure distribution. For the experimental inve tion, a two-dimensional water jet issuing horizon-tally in the proximity of a free (air-water interface) offset surface was studied. Hot film anemometry was used to determine the speed distribution in the jet and recirculation regions for a non-heated jet. Streamlines, jet centerline, reattachment point, and surface deflection for both non-heated and heated jets were recorded photographically using a microbubble flow visualization technique.

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Thermistor sensor temperature probes were used to record the temperature history of the heated jets. The recirculation region was found to be a forced vortex centered between the jet and the offset (free) surface with jet structure identical for both non-heated and equilibrium heated jets. Comparison with existing data for air jets with a rigid offset boundary showed the effects of Reynolds number to be negligible. The surface deflection for a free offset surface was found to be analogous to the surface pressure distribution for a fixed offset surface. The analysis used the pressure field of the forced vortex to predict the jet characteristics. The agreement with present and previously existing data, encompassing data for air and water, fixed and free offset surfaces, was quite good for a wide range of submergences. The analysis exhibited the expected asymtotic behavior for deeply submerged jets. (de Lara-Connecticut)

DENITRIFICATION IN INDIANA LAKE, RESERVOIR, AND POND SEDIMENTS, Purdue Univ., Lafayette, Ind.

R. E. Terry.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 473, \$4.75 in paper copy, \$2.25 in microfiche. Master of Science Thesis, May 1974. 71 p, 5 fig, 21 tab, 36 ref, append. OWRR A-019-IND(4).

Descriptors: *Denitrification, *Sediments, *Lake sediments, *Sediment-water interface, *Anaerobic conditions, Chemical reactions, Bottom sediments, Mud-water interface, Calcium carbonate, Nitrates, Nitrites, *Indiana, Lakes, Ponds, Reservoirs, Kinetics.

Identifiers: Reservoirs ediments, Pond sediments.

This study was undertaken: (1) to determine the influence of environmental and experimental factors on denitrification in incubated sediments. (2) to determine the potential rates of denitrification in a variety of Indiana lake, pond, and reservoir sediments, (3) to determine relationships between denitrification rates in sediments and other sediment properties, and (4) to study the kinetics and the activation energy of denitrification in sedi-ments. Sediments were sufficiently anaerobic for rapid denitrification. Denitrification rates of 51 to 171 micro g nitrate-N per g of sediment per day were observed in five lake samples. Simple correlation techniques revealed that only calcium carbonate content of sediments was related to the denitrification rate. Denitrification followed zero order kinetics at high concentrations of nitrate, whereas, first order kinetics were followed at low concentrations. The activation energy of denitrifi-cation was determined to be at 11.2 to 14.2 kcal per mole. The findings indicated that denitrification in sediments may be an important factor in the nitrogen budget of lakes, ponds and reservoirs. W75-05785

TRANSIENT THREE DIMENSIONAL MODELING OF TEMPERATURE DISTRIBUTIONS IN RIVERS WITH AND WITHOUT THERMAL DISCHARGES,
Purdue Univ., Lafayette, Ind. School of Mechani-

cal Engineering.
R. G. Hills.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 521, \$5.75 in paper copy, \$2.25 in microfiche. M.S. Thesis, May 1974. 127 p. 42 fig, 6 tab, 62 ref, 4 append. OWRR A-029-IND(6).

Descriptors: *Thermal radiation, stratification, *Radiation, *Solar radiation, Rivers, Reservoirs, Distribution patterns, Reflectance, *Thermal pollution, Model studies, Channels.

Identifiers: *Thermal discharges, *Thermal instability, Alternating direction implicit, Radiation scattering, *Temperature distribution.

An analytical model was developed for predicting the transient three-dimensional temperature distribution in a thermally stratified channel simulat-ing a river. The effects of thermal discharges and various meteorological conditions and channel parameters on the thermal structure in water are analyzed and discussed. The model considers the diurnal cycle in which the incoming solar and at-mospheric radiation are functions of time. The reflections from the air-water interface and the bottom of the channel are accounted for. Since the interaction of solar radiation with water is not a surface but a volume phenomenon, internal ab-sorption and scattering of radiation are considered and the volumetric solar heating is determined. The effects of thermal stratification on turbulence are included in the model. The energy equation is nonlinear and of complex form, therefore an A.D.I. (alternating direction implicit) finite difference technique is used to predict the temperature distribution for a realistic range of parameters and boundary conditions of interest. The analytical results indicate that in relatively clear rivers without thermal discharges, the radiation absorbed by the bottom causes a thermal instability. The rivers without thermal discharges were also well mixed at night due to the thermal instability caused by surface cooling. W75-05786

ENVIRONMENTAL FACTORS AFFECTING THE PROPERTIES AND PRECIPITATION OF COLORING COLLOIDS IN AQUATIC HABITATS,

Louisiana State Univ., New Orleans. Dept. of Biological Sciences. B. R. Bordelon.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 483, \$5.25 in paper copy, \$2.25 in microfiche. M.S. Thesis, August 1973. 113 p, 17 fig, 10 tab, 43 ref, 3 append. OWRT A-028-LA(3).

Descriptors: *Color, *Colloids, Water analysis, *Chemical reactions, *Humic acids, Water pollution sources, *Louisiana, Chemical precipitation, Water pollution effects.

Identifiers: *Humic substances.

Coloring colloids of aquatic habitats from southeastern Louisiana are polymeric aromatic hydroxy-carboxylic acids, which are fulvic, hymatomelanic, and humic. Color in the area range from 0 to 5150 units. Ferric iron is associated with the colloidal complex which, along with their nega-tive charge, assists in stabilizing the complex. Percentage of ferric hydroxide in the colloidal complex varied from 0.2 to 97.3%. Particle size has a range of 5-35 m micro. In freshwater habitats fulvic acid is dominant followed by hymatomelanic then humic acids. In brackish-water to sea-water habitats the fulvic acid component precipitates. At these habitats, hymatomelanic acid is dominant followed by humic acid. Infrared analysis of fulvic acid demonstrates that the functional groups associated with this acid have a high adsorptive capacity and are easily ionizable. Color varies with both habitat and seasonal differences. Precipitation of color is accomplished by redox shifts and salinity increase. The coloring colloids are responsible for many ecological ramifications, such as altering chemical parameters, pollutant transport along with pollution bio-accumulation, in aquatic habitats. W75-05787

FOULING OF HEAT EXCHANGERS FROM COOLING WATER AND PROCESS MATERIALS

Dearborn Chemicals Ltd., Widnes (England). C. B. Capper. Effluent and Water Treatment Journal, Vol 14, No 6, p 309-314, June 1974.

Descriptors: *Fouling, *Heat exchangers, Flow patterns, Heat transfer, Corrosion, Scaling, Feeds, Cooling water.

Identifiers: Particulate deposition, Waterside fouling, Process materials.

Fouling is defined as any deposit on heat exchange surfaces which affects the flow patern through the heat exchanger, the efficiency of the heat transfer process or both. Fouling on the waterside can be the result of scale, corrosion, particulate deposition, microbiological growths or process materials having entered the waterside. Fouling on the process side can be caused by deposition of the primary process product itself, materials caused by side reactions, impurities present in the feedstock or other deposits caused in a similar way to those from the waterside. (Leibowitz-FIRL)

ESTUARIAL AND COASTAL POLLUTION,

A. D. Buckley. Water Pollution Control, Vol 73, No 3, p 307-314, 1974. 3 ref.

Descriptors: *Water pollution sources, *Estuaries, *Coastal waters, Sewage, Bacteria, Detergents, Industrial wastes, Domestic wastes, Zinc, DDT, Chemical fertilizer, Legal aspects, Legislation. Identifiers: The Royal Commission of 1865, The River Pollution Prevention Act of 1876, United Kingdom.

The three main sources of pollution in estuaries are domestic sewage, industrial waste waters and the detrimental quality of the rivers entering the estuaries. Chemical fertilizers being used in rural areas and run-off from roads and other non-permeable surfaces also contribute to contamination. DDT usage has a long range effect. Metaliferous mining waste has effective sterilized many streams downstream from industries, where, as in Wales, examples of such pollution are evident in adjacent coastal waters. Disinfectants, detergents, nutrients from human waste, zinc-based ointments and facial creams, and the bacteria found in biological filters in an activated sludge plant are more sources of estuarial and coastal pollution. Diversion of sewage downstream to an outfall into the sea is one remedy, along with biological treatment and removal of solids by screening. (Leibowitz-FIRL)

NEW PRIORITIES FOR GROUND-WATER QUALITY PROTECTION, Geraghty and Miller, Port Washington, N.Y.

D. W. Miller, and M. R. Scalf. Ground Water, Vol 12, No 6, p 335-347, November-December 1974. 3 tab, 4 ref.

Descriptors: Water pollution, *Water pollution sources, *Water pollution control, *Groundwater, Septic tanks, Cesspools, Flooding, Landfills, Irrigation, Sewage effluents, Lagoons, *Regional analysis, Pollutants, *Water quality, *Priorities, Reviews, Comprehensive planning, Path of polluterts

Four regional studies of the status of groundwater pollution problems in 26 states involved comprehensive reviews of the literature and contacts with public officials and others involved in water supply, so that individual case histories of groundwater contamination problems could be evaluated. Septic tanks and cesspools, petroleum exploration and development, landfills, irrigation return flows, and surface discharges, impoundments, and spills are the principal sources leading to degradation of groundwater quality. Only a very small percentage of the instances of groundwater contamination that probably exist has been discovered to date, and almost all the reported cases were only discovered after a water-supply source had been noticeably affected by one or more pollutants. In the vast majority of cases inventoried, the problem has not been corrected and will become more troublesome in the future. A prime need in all four regions is a greater effort toward locating

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and evaluating as many additional cases of ground-water contamination as possible. (Gibb-ISWS) W75-05827

TRANSPORT OF SUSPENDED SOLIDS ALONG THE VISTULA RIVER, Panstwowy Instytut Hydrologiczno-Meteorolog

iczny, Warsaw (Poland). For primary bibliographic entry see Field 2J. W75-05828

SOLVENTS IN SEWAGE AND INDUSTRIAL WASTE WATERS: IDENTIFICATION AND DETERMINATION,

Lancashire River Authority (England). For primary bibliographic entry see Field 5A.

5C. Effects Of Pollution

RESPONSE OF NEADSHODE PERIPHYTON IN WESTERN LAKE SUPERIOR TO THERMAL ADDITIONS,

Minnesota Univ., Minneapolis. School of Public Health.

D. B. Drown, T. A. Olson, and T. O. Odlaug Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-239 963, \$6.25 in paper copy, \$2.25 in microfiche. University of Minnesota Water Resources Research Center, Minneapolis, Bulletin No. 77, October 1974. 159 p, 77 fig, 3 plates. OWRT B-020-MINN(4). 14-31-0001-3095.

Descriptors: *Periphyton, *Nutrients, *Lake Superior, Productivity, *Minnesota, Algae, perior, Productivity, *Minnesota, Algae, Phosphates, Nitrates, *Thermal pollution, Water pollution effects.

Identifiers: Complete nutrient media, Control pool, Test pool.

The intent was to ascertain what effects a temperature increase in the order of 10 to 12C would have on the near-shore periphyton assemblage of Western Lake Superior. A field station, complete with holding tanks and a hot water source, was constructed on a rock ledge of the Lake Superior shore near Castle Danger, Minnesota. During the summer and fall of 1971 and 1972 periphyton covered rocks from the local area of the lake were placed in the experimental holding tanks where they were exposed to a continuous flow of lake water. Denuded rocks were included as part of a regrowth study. One system provided a flowthrough of unheated lake water while in the other the temperature was raised above ambient. Growth patterns were followed under both sets of conditions. Periphyton samples were collected on a weekly basis from the ambient control and heated water tanks and were analyzed for photosynthetic pigment, qualitative examination of the phyletic distribution of algae from the two systems was emphasized. While a great deal more needs to be learned of the effects of thermal-additions on Lake Superior, this study indicates that, if near-shore areas of the lake were warmed to the extent that could occur as the result of a thermalelectric generating station discharge, changes in the phyletic composition of the local periphyton community could be expected. The change from diatoms to greens could have serious repercussions on benthic grazers and on the entire foodweb of the affected area. (Waelti-Minnesota) W75-05354

NITROGEN BUDGET OF A NORTH CAROLINA ESTUARY.

North Carolina State Univ., Raleigh. Dept. of Zoology. For primary bibliographic entry see Field 5B.

W75-05357

THE THREE DIMENSIONAL HEATED SUR-FACE JET IN A CROSS FLOW, Johns Hopkins Univ., Baltimore. Chesapeake Bay

For primary bibliographic entry see Field 5B. W75-05360

Inst.

ENVIRONMENTAL EFFECTS OF A TRITIUM GAS RELEASE FROM THE SAVANNAH RIVER PLANT ON MAY 2, 1974,

Du Pont deNemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.

Available from NTIS, Springfield, Va 22161 as Rept. No. DP-1369. Report DP-1369, November 1974. 29 p, 11 fig, 8 ref.

*Radioactivity, Accidents, Air pollution, Meteorology, Fallout, Sampling, Analysis, Water pollution, Hazards, Respiration, Absorption, Food chains, Environmental effect, Public health, *South Carolina. Identifiers: Dose, *Savannah River Plant(So Car).

On May 2, 1974, 479,000 Ci of tritium gas was released from a Savannah River Plant exhaust stack to the atmosphere over a period of about four minutes. The release resulted from a metallurgical failure of a process valve in a tritum processing facility. Light winds of 4 to 6 mph car-ried the tritium in a northeasterly direction. Calculations indicate it passed out to sea from the southern half of the North Carolina coast about 36 hours after the release. Measurements of tritium offplant indicated that less than 1% of the tritium was in the oxide form. A maximum potential dose to a person (from inhalation and skin absorption) at the puff centerline on the plant boundary was calculated to be 0.14 mrem, less than 1% of the annual dose received from natural radioactivity. The population dose was calculated to be 8 man-rem before the tritium passed out to sea. An extensive environmental sampling program was conducted after the release to verify the predicted trajectory of the tritium and to determine potential individual dose commitment. Potential individual doses via the food chain were less than 1 mrem. (Houser-W75-05361

ENVIRONMENTAL SURVEILLANCE AT LOS ALAMOS DURING 1973, Los Alamos Scientific Lab., N.M.

For primary bibliographic entry see Field 5A. W75-05362

BIBLIOGRAPHY OF PUBLISHED PAPERS OF THE ATOMIC BOMB CASUALTY COMMIS-

Atomic Bomb Casualty Commission, Hiroshima (Japan); and Atomic Bomb Casualty Commission, Nagasaki (Japan).

Available from the National Technical Information Service, Springfield Va. 22161, as REPT. No. ABCC TR 0-72, \$4.00 in paper copy, \$2.25 in microfiche. Report ABCC TR 0-72, 1972. 8 p, 59

*Bibliographies, *Civil Descriptors: *Pathology, *Nuclear explosions, *Civil defense, *Radioactivity effects, *Human population, Cytological studies, Human diseases, Monitoring, Measurement, Assessment, Assay, Public health. Identifiers: *Japan.

This bibliography contains 59 references of pathologic studies related to the Atomic Bomb Casualty Commission (ABCC) effort in Japan. The ABCC Technical Reports provide the official bilingual statements required to meet the needs of Japanese and American staff members, con-sultants, advisory groups, and affiliated government and private organizations. The Technical Report Series is in no way intended to supplant regular journal publication. (Houser-ORNL) W75-05366

BIBLIOGRAPHY ON PUBLISHED PAPERS OF THE ATOMIC BOMB CASUALTY COMMIS-

Atomic Bomb Casualty Commission, Hiroshima (Japan); and Atomic Bobm Casualty Commission, Nagasaki (Japan).

*Pathology, Descriptors: *Bibliographies, Pationographes, "rationogy, "Nuclear explosions, "Civil defense, "Radioactivity effects, Human population, Cytological studies, Human diseases, Monitoring, Measurement, Assessment, Assay, Public health. Identifiers: *Japan.

This bibliography contains 51 references of pathologic studies related to the Atomic Bomb Casualty Commission(ARCC) office in Technology asualty Commission(ABCC) effort in Japan. The ABCC Technical Reports provide the official bilingual statements required to meet the needs of Japanese and American staff members, con-sultants, advisory groups, and affiliated govern-ment and private organizations. The Technical Report Series is in no way intended to supplant regular journal publication. (Houser-ORNL)

FISH PROTECTION AT INTAKE STRUCTURES AND DAMS: GUIDANCE, SCREENS AND COL-LECTION DEVICES. A SELECTED BIBLIOG-RAPHY WITH ABSTRACTS,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 8I. W75-05372

SIGNIFICANCE OF STABLE IODINE-127 IN

MILK, New York State Dept. of Environmental Conservation Albany.
For primary bibliographic entry see Field 5B. W75-05373

ELECTRONIC IDENTIFICATION AND TEM-PERATURE MONITORING, Los Alamos Scientific Lab., N. Mex. For primary bibliographic entry see Field 7B. W75-05381

SOME ASPECTS OF THE EFFECTS OF ELEVATED WATER TEMPERATURE ON THE

RAMSHORN SNAIL, Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.

G. B. Johnson. Available from NTIS, Springfield, Va. as REPT. No. DP-MS-73-69, \$4.00 in paper copy, \$2.25 in microfiche. Report DP-MS-73-69, 1974. 12 p, 6 fig, 2 tab, 7 ref. CONF-740433-1)

Descriptors: "Cooling water, "Nuclear power-plants, "Thermal pollution, Pollutants, Tempera-ture, "Snails, Reservoirs, Geothermal studies, Ponds, Resistance, Respiration, Ecology, Ecosystems, Water pollution effects, Distribution, Density, Life cycles, Growth rates, Growth stages, Behavior, effects, "South Carolina. Identifiers: Par Pond(So Car).

The effects of location in relation to a thermal gradient on two abundantly distributed species of

ramshorn snails, Helisoma trivolvis and Helisoma anceps, are being investigated ata a 2500-acre reactor cooling reservoir (Par Pond) on the Savannah River Plant. Observations and results of ongoing experiments related to the thermal tolerance, respiratory rates, distribution and density, life cy-cles and growth, and behavioral patterns of Helisoma in Par Pond are discussed. (Houser-ORNL) W75-05387

A PROPOSED RAINOUT HAZARD MODEL FOR SYSTEMS ANALYSIS STUDIES,

California Univ., Livermore. Lawrence Liver-

Group 5C-Effects Of Pollution

For primary bibliographic entry see Field 5B. W75-05388

PHYTOPLANKTON PRODUCTION IN CHAR LAKE, A NATURAL POLAR LAKE, AND IN MERETTA LAKE, A POLLUTED POLAR LAKE, CORNWALLIS ISLAND, NORTHWEST TERRITORIES TERRITORIES.

McGill Univ., Montreal (Quebec). Dept. of Biolo-

J. Kalff, and H. E. Welch.

Journal of the Fisheries Research Board of Canada, Vol 31, No 5, p 621-636, May, 1974. 16 fig. 5 tab, 18 ref.

*Phtoplankton, *Photosynthesis, Descriptors: *Chlorophyll, Sewage, Snow cover, Productivity, Comparative productivity, Ecology, Oligotrophy, *Canada, Lakes, Primary productivity. Identifiers: Ultraoligotrophic, Polluted, Nutrient deficiencies, Benthic production.

Between 1969 and 1972, the phytoplankton production of ultraoligotrophic Char Lake and polluted Meretta Lake were studied, and findings are presented. In Char Lake, the most oligotrophic lake existing, photosynthesis occurs during the entire nine months that the sun is above the horizon. The production rate is much more constant than would be suggested by the light input (on which snow cover has a considerable effect) because of changes in depth of maximum photosynthesis, in efficiency of low light utilization, and in optimal light flux. Meretta Lake has a greater phytoplankton production and chlorophyll consentration twenty times greater than Char Lake. Nutrient deficiencies are most likely responsible for low production in Char Lake. In both lakes benthic production is of major significance. (Nelson-FIRL) W75-05396

TISSUE DISTRIBUTION OF (14C)DDT IN THE LOBSTER AFTER ADMINISTRATION VIA INTRAVASCULAR OR ORAL ROUTES OR AFTER EXPOSURE FROM AMBIENT SEA

National Cancer Inst., Bethesda, Md. Lab. of Tox-

A. M. Guarino, J. B. Pritchard, J. B. Anderson, and D. P. Rall.

Toxicology and Applied Pharmacology, Vol 29, p 277-288, 1974. 1 fig, 5 tab, 11 ref.

Descriptors: *DDT, *Lobsters, *Pesticides, Water pollution effects, Insectisides, Pollutants, Chlorinated hydrocarbon pesticides, Bioassay, Carbon radioisotopes, Radioactivity, Aquatic life. Identifiers: Carbon 14.

A pharmacokinetic approach to studying the fate and distribution of carbon 14 labeled DDT was employed using the lobster. The radioactive pesticide was administered intravascularly, orally and by exposure from the ambient water. After injection, there was rapid removal of (14C)DDT from the plasma and a persistent increase in the amount of radioactivity in the hepatopancreas. Seven day after injection about 90 percent of the administered radioactivity was found in the hepatopancreas. When the DDT was administered to the lobster from the ambient water or from food, again more than 90 percent of the radioactivity was found in the hepatopancreas seven days after treatment. Studies concerning the levels of DDT metabolites in the organs of untreated lobsters indicated that the egg masses contained the largest amount followed by the hepatopancreas and then by the carcass (muscle). These studies suggest that the lobster may protect itself from DDT toxicity by sequestering DDT in the hepatopancreas and in egg masses but that the bioconcentration in these tissues could be harmful to organisms which eat these parts of the lobster. W75-05401

DISTRIBUTION AND METABOLISM OF DDT IN THE CATFISH HETEROPNEUSTES FOS-RELATION TO THE SIGNS POISONING. Delhi Univ. (India). Dept. of Zoology.

H. C. Agarwal, and B. Gupta. Toxicology and Applied Pharmacology, Vol 29, p 204-209, 1974, 2 tab, 22 ref.

Descriptors: *DDT, *Pesticide toxicity, *Water pollution effects, *Fish, Pesticides, Insecticides, DDE, Pollutants, Chlorinated hydrocarbon pesticides, Food chains, *Catfishes. Identifiers: Heteropneustes fossilis.

The extensive use of DDT has resulted in its widespread occurrence in the environment. DDT is known to be concentrated as it moves up the food chain. Since fish are an important part of the food chain, it is necessary to know the form in which DDT is accumulated and whether any detoxication occurs in fish. Adult male catfish were given a lethal dose of 800 mg DDT/kg. The metabolites of DDT in different tissues were studied after 24 hours. DDE was the only metabolite found. The major percentage of the DDE was found in the kidney and lesser amounts were found in the liver and fat bodies. The concentration of DDT increased with time and severity of poisoining. The brain and spinal cord has the lowest DDT content. The DDT content in the fat rose steadily and was highest in fish which had recovered. It was indicated that the signs of poisoning in catfish were directly related to the concentration of DDT in the brain and spinal cord. (Orr-FIRL) W75-05402

PHYSIOLOGICAL STATE RESPECT TO PHOSPHORUS OF CAYUGA LAKE PHYTOPLANKTON, New York State Coll. of Agriculture and Life

Sciences, Ithaca, N.Y. Ecology and Systematics

B. J. Peterson, J. P. Barlow, and A. E. Savage. Limnology and Oceanography, Vol 19, No 3, p 396-408, 1974. 7 fig, 3 tab, 34 ref. GWRRA-035-

Descriptors: *Plant physiology, *Phosphorus, *Phytoplankton, *New York, Nutrients, Limiting factors, Carbon, Growth rates, Equilibrium, Water pollution effects. Identifiers: *Cayuga Lake(N.Y.).

The nutrient status of Cayuga Lake, New York phytoplankton was estimated by maintaining the mixed populations under a variety of controlled nutrient conditions in laboratory continuous flow cultures. Valves of parameters describing these laboratory cultures are compared to those of fresh lake samples to estimate the nutrient status of the in situ populations. Rates of carbon assimilation were determined by C-14 uptake and available car-bon was estimated from pH and alklalinity. Changes in the C:P ratio rate of carbon uptake per unit carbon, and species composition were fol-lowed in nutrient limited and nutrient sufficient cultures. Rates of change of relative abundance and final values for the C:P ratio and rates of carbon uptake per unit carbon are related to parameters describing the lake populations. These com-parisons suggest that these phytoplankton are limited by phosphorus but are rarely phosphorus deficient. Which species are capable of rapid in-creases during periods of nutrient surplus are known. Determinations of in situ rates of division of important species would allow significant further advances in understanding the values related to species growth in unialgal and mixed cul-tures to further elucidate the effects of nutrients on the abundance and composition of natural phytoplankton assemblages. (Jones-Wisconsin) W75-05406 CALCULATED DISTRIBUTION OF CHEMICAL SPECIES OF COPPER, ZINC, CADMIUM AND LEAD IN 16 LAKES OF NORTHERN ITALY, European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.

For primary bibliographic entry see Field 5B. W75-05413

MERCURY: ASPECTS OF ITS ECOLOGY AND ENVIRONMENTAL TOXICITY, Hawaii Univ., Honolulu. Dept. of Botany. For primary bibliographic entry see Field 5B.

MEASUREMENTS OF MERCURY SORPTION

BY ALGAE, Naval Research Lab., Washington, D.C. Ocean For primary bibliographic entry see Field 5A. W75-05415

INVESTIGATION OF SOME FACTORS IN THE BIOCHEMICAL CONVERSION OF MERCURY POLLUTANTS TO TOXIC METHYLMERCURY EFFECTED BY MICRO-ORGANISMS IN A

MARINE SEDIMENT,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 5B.

THE RELATION BETWEEN PRIMARY PRODUCTIVITY, NUTRIENTS, AND THE TROUT ENVIRONMENT IN SOME NEW ZEA-LAND LAKES, Marine Dept., Wellington (New Zealand). Fish Research Div.

A. M. R. Burnet, and Denise A. Wallace. N Z Fish Res Div Fish Res Bull. 10. 1-18. Illus.

Identifiers: *Carbon-14 technique, Environment, Eutrophication, Fishery, Lakes, *New Zealand, *Nutrients, Phytoplankton, *Primary productivity, Respiration, Trout.

The trophic levels of 15 lakes in both islands of New Zealand were measured by the carbon-14 technique. The lakes ranged from an ultraoligotrophic South Island high country lake (Lake Coleridge) to highly eutrophic lakes (Forsyth and Orakai). Relationships were established between the assimilation rate (P max) and the levels of chlorophyll a, soluble P, reactive nitrate, 02 absorbed by phytoplankton respiration and the transparency of the water. Low 02 levels and low transparency of the water are the 2 direct effects of eutrophication on a trout fishery and both are directly related to high P max values. The correlation between P max and the P and N levels enables us to relate them to the O2 balance and to the transparency of the lake waters. Amounts of inorganic P in excess of 0.01 ppm can lead to nuisance conditions.--Copyright 1974, Biological Abstracts, Inc. W75-05419

INFLUENCE OF SALINITY AND TEMPERA-TURE ON THE TOXICITY OF MERCURY TO MARINE AND BRACKISH WATER ISOPODS (CRUSTACEA),

Liverpool Univ., Port Erin (England). Dept. of Marine Biology.

Estuarine Coastal Mar Sci. 1(4): 425-431. Illus.

1973.
Identifiers: Brackish water, Crustacea, Idotea-Emarginata, Idotea-Neglecta, Jaera-Albifrons, Jaera-Nordmanni, *Mercury, Pollution, *Salinity, *Toxicity, *Water temperature, *Water isapods, Marine water, Water pollution effects.

Under optimum conditions of salinity (100% sea water 34%) and temperatuer (10C) marine (Idotea

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emarginata and Idotea neglecta) and estuarine (Faera nordmanni and Faera albifrons sensu stricto) species of isopods can tolerate concentrations of 1 and 0.1 ppm Hg (mercuric chloride) for 5 days without achieving 50% mortality (median lethal concentration, LC50>120h). A decrease in salinity and an increase in temperature caused a dramatic increase in the toxicity of Hg and shortened LC 50 values. Species adapted to a fluctuating estuarine environment are more influenced by the extra stresses of heavy metal pollution than marine forms for which environmental variables are relatively more stable .-- Copyright 1974, Biological Abstracts, Inc. W75-05420

THE EFFECT OF A MUNICIPAL EFFLUENT ON THE MICROBIAL POPULATIONS OF THE WILLIMANTIC/SHETUCKET RIVERS,

Connecticut Univ., Storrs. S. G. Hornor.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 029, \$5.75 in paper copy, \$2.25 in microfiche. Master of Science Thesis, 1974. 117 p, 28 fig, 8 tab, 90 ref, append. OWRR A-052-CONN(3), 14-31-0001-4007.

Descriptors: Aquatic microorganisms, *Municipal wastes, *Water pollution effects, Effluents, River flow, *Coliforms, *Aquatic bacteria, *Yeasts, Algae, Bioindicators, Water quality, Wastewater

reatment, *Connecticut.

Identifiers: River microflora, *Microbial populations, Fecal coliforms, *Willimantic/Shetucket Rivers(Connecticut).

The distribution and relative numbers of bacteria, yeast and algae in a river system in central Connecticut receiving primarily treated municipal effluent was examined over a 15 month period. With respect to selected chemical and microbial variables, including total coliform/fecal coliform ratios, the impact of the municipal effluent was minimal a short distance downstream from the study area. Rather, the single most important factor determining the annual distribution of river microflora was river flow. A high correlation was found between the yeast populations and other microbial and environmental variables, suggesting that these organisms may be significant indicators of water quality. (de Lara-Connecticut) W75-05438

THE RELATIONSHIP BETWEEN WATER-FOWL AND NITROGEN SPECIES IN THE WATERS OF THE BOSQUE DEL APACHE, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry. For primary bibliographic entry see Field 5B. W75-05469

CADMIUM AND ZINC BINDING IN MAM-MALIAN LIVER AND KIDNEYS, Dalhousie Univ. Halifax, (Nova Scotia). Dept. of Biochemistry.
For primary bibliographic entry see Field 5A.

RELATIVE TOXICITIES OF SELENITE AND SELENATE IN THE DRINKING WATER OF RATS.

South Dakota State Univ., Brookings. Dept. of Biochemistry.

Journal of Nutrition, Vol 104, No 3, p 306-314, March, 1974. 6 tab, 10 ref.

Descriptors: *Metals, *Rodents, *Potable water, *Toxicity, Inorganic compounds, Animal pathology, Laboratory tests, Testing procedures, Water ollution effects. Identifiers: *Selenium.

Several levels of sodium selenite or sodium selenate were administered in the drinking water of Sprague-Dawley rats (21 days of age) receiving a corn or rye-based diet to determine the relative toxicities of the two forms of selenium. Levels of selenium of 2 or 3 ppm produced a small decrease in weight in 4 or 6 weeks as compared with the control, but no mortality occurred. There was no significant difference between the effects of the two forms of selenium with respect to weight gains. When rats were exposed to water containing 6 or 9 ppm of selenium as either ion, considerable mortality occurred. More rats receiving selenite died than did rats that received selenate. Overall, the toxicities of the two forms of selenium were similar. (Jernigan-Vanderbilt) W75-05490

PATHOLOGICAL CHANGES PRODUCED IN JAPANESE QUAIL BY INGESTION OF CADMI-

Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.

M. E. Richardson, M. R. S. Fox, and B. E. Fry, Jr. Journal of Nutrition, Vol 104, No 3, p 323-338, March, 1974. 4 tab, 22 fig, 40 ref.

Descriptors: *Cadmium, Zinc, Iron, *Animal pathology, *Toxicity, Animal physiology, Birds, Laboratory tests, Testing procedures, Water pollution effects Identifiers: *Japanese quail.

Histological sequelae of feeding 75 mg cadmi-um/kg of diet from hatching to 4 or 6 weeks of age were studied in Japanese quail (Esturnix coturnix japonica). Effects of cadmium were compared with those of zinc and iron deficiencies at 4 weeks, and the protective effects of ascorbic acid against cadmium were investigated at 4 and 6 weeks. Testicular hypoplasia and growth retardation oc-curred in 4-week-old quail fed either cadmiumcontaining or zinc-deficient diets. Severe anemia and bone marrow hyperplasia were present in birds fed either cadmium-containing or iron-deficient diets. The morphological appearance in circulating erythrocytes was not the same with both treatments. Both heart ventricles were hypertrophied in response to cadmium at 6 weeks, whereas hypertrophy was not microscopically at 4 weeks, even though the weight was significantly increased in relation to body weight. Enteropathy of the small intestine was more severe after 6 weeks of cadmium feeding than after 4 weeks. Ascorbic acid added to the cadmium-containing diet significantly alleviated or prevented almost all aspects of cadmium toxicity in quail at 4 and/or 6 weeks of age. It protected against some changes that were not observed in either zinc or iron-deficient birds. (Jernigan-Vanderbilt) W75-05491

INFLUENCE OF ENDRIN ON SOIL MICROBI-AL POPULATIONS AND THEIR ACTIVITY, Forest Service (USDA), Portland, Oreg. Pacific Northwest Forest and Range Experiment Station. For primary bibliographic entry see Field 5B. W75-05497

AN ANNOTATED BIBLIOGRAPHY OF THE EF-FECTS OF LOGGING ON FISH OF THE WESTERN UNITED STATES AND CANADA, Washington Univ., Seattle. Coll. of Fisheries. D. R. Gibbons, and E. O. Salo.

USDA Forest Service General Technical Report PNW-10, 1973, 145 p. PNW-1602.

Descriptors: *Lumbering, *Fish, *Erosion, Sedimentation, Water quality, Streamflow, Stream stabilization, Stream improvement, Water pollution effects, *Bibliographies.

Identifiers: Multiple use management, Streamside

vegetation.

An annotated bibliography is presented of litera-ture published on the effects of logging on fish and aquatic habitat of the Western United States and Canada. Included are 278 annotations with a total of 317 references. Subject areas include erosion and sedimentation, water quality, related in-fluences upon salmonids, multiple logging effects. alteration of streamflow, stream protection, multiple-use management, streamside vegetation, stream improvement, and studies on effects of logging. A review of the literature, a narrative on the state of the art, and a list of research needs determined by questionnaires are included.
(Forest Service)

OHIO BIOLOGICAL SURVEY BIOLOGICAL NOTES NO. 6. EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO, WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS,

Ohio State Univ., Columbus. J. B. Judd, and S. H. Taub.

1973. 51 p, Illus, Maps. In cooperation with the Ohio Cooperative Fishery Unit: Columbus, Ohio. Identifiers: *Aquatic plants, Biological studies, *Buckeye Lake(Ohio), Ecological studies, Fishes, Iowa, Lakes, *Largemouth bass, Micropterus-sal-moides-salmoides, *Ohio, Parasites, Lake Erie, Lake Okoboji(Iowa), Surveys.

Results of investigation on the effects of ecological changes in Buckeye Lake, Ohio, are reported. The changes were evaluated by field and laboratory studies by literature search, with emphasis on the effects of the changes on the status of the largemouth bass, Micropterus salmoides salmoides and the higher aquatic plants. Historical background and a description of the study area are presented. Tables on aquatic vegetation give data on: comparison of those species present in Buckeye Lake in 1906 and 1970; those continuing to survive in Buckeye Lake, Put-In-Bay Harbor (Lake Erie), and Lake Okoboji (Iowa); and, those which have disappeared from these locations. Species composition of fishes in Buckeye Lake was examined. Data are presented on the largemouth bass's age, growth and parasites. The parasites are listed by scientific name and identified by location in the fish, total number, and percent incidence of infection and percent incidence of infection is compared for 1930 and 1970. A summary lists con-clusions reached by the studies. Additional tables in the appendix enumerate the number and in-cidence of infection of parasites and in immature and mature largemouth bass in Buckeye Lake in 1970. A reference list concludes the text.—Copyright 1974, Biological Abstracts, Inc. W75-05505

STRESS OF FORMALIN TREATMENT IN JU-VENILE SPRING CHINOOK SALMON (ONCORHYNCHUS TSHAWYTSCHA) AND STEELHEAD TROUT (SALMO GAIRDNERI), Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab. G. Wedemeyer, and W. T. Yasutake.

J Fish Res Board Can. Vol 31, No 2, p 179-184, 1974. Illus.

Alkalosis, *Chinook Gills, Juveniles, Oncorhynchus-a, *Parasite control, Salmon, *Formalin. tshawytscha, *Steelhead trout, Treatment, Respiration.

The physiological stress of 200 ppm formalin treatments (used in fish husbandry to control external parasites) in 10C is more severe in the juvenile steelhead trout (S. gairdneri) than in the spring chinook salmon (O. tshawytscha). In the steel-head, a marked hypochloremia follows a 1-h treatment and recovery requires about 24 h. During longer treatments, hypercholesterolemia together with reduced regulatory precision, hypercorisolemia, alkaline reserve depletion, and hypocapnia unaccompanied by a fall in blood pH occur, suggestive of compensated respiratory al-

Group 5C-Effects Of Pollution

kalosis. In the spring chinook, hypochloremia and reduced plasma cholesterol regulatory precision are the significant treatment side effects but recovery requires only a few hours. Formalin treatments also cause epithelial separation, hypertrophy, and necrosis in the gills of both fishes but again, consistent with the physiological dysfunctions, these are more severe in the steelhead,--Copyright 1974, Biological Abstracts, Inc.

THE VITAL ROLE OF PROTOZOA IN MOBILE

Organization University of South Alabama, Mobile. Dept. of Biological Sciences. For primary bibliographic entry see Field 2L. W75-05525

THE RELATIONSHIP OF ELECTRIC POWER STATION THERMAL CIRCULATION TO BIOLOGICAL PRODUCTIVITY: PHASE II - CONTROL OF THERMAL POLLUTION BY BIOLOGICAL SYSTEMS,
Baylor Univ., Waco, Tex. Inst. of Environmental

O. T. Lind, and T. C. Franklin Available from the National Tec'inical Information Service, Springfield, Va. 22161, as PB-240 184, \$3.25 in paper copy, \$2.25 in microfiche. Completion Report, February 1975, 16 p, 6 fig, 2 tab, 4 ref. OWRT B-135-TEX(1), 14-31-0001-3937.

Descriptors: *Thermal pollution, *Metabolism, *Algae, *Bacteria, *Fungi, Beneficial use, Productivity, Water pollution control, Water pollution effects, Inhibition, Heated water, Cooling water.

This project studied the feasibility of utilizing biological systems in controlling thermal pollution by absorbing heat from their surroundings during metabolic processes. Cooling and/or warming slopes were compared on ten algal, eleven bacterial, and three fungal species that were active or killed or metabolically inhibited. Results of 318 experiments failed to conclusively demonstrate that any active system was capable of metabolically using heat energy. The very slight differentials detected on certain species, though of theoretical in-terest, were considered too small for practical application. W75-05533

CADMIUM ACCURAL IN A COMBINED WASTEWATER TREATMENT-AQUACULTURE

Woods Hole Oceanographic Institution, Mass.

W. B. Kerfoot, and S. A. Jacobs.
In: Proceedings of the First Annual Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 225-244, 2 fig, 2 tab, 23 ref.

Descriptors: *Cadmium, *Waste water treatment, *Aquatic environment, *Tertiary treatment, Algae, Oysters, Adsorption, Absorption, Seawater, Toxicity, Food chains, Human physiology, Public health, Effluents, Foods, *Trace elements,

Cadmium was introduced as CdI2 in graded con-centrations from .006 to .10 ppm into isolated units of a tertiary treatment - marine aquaculture system which cultured algae, oysters, and clams. The cad-mium was readily taken up or absorbed to algae, reaching equilbrium levels after two or three days exposure. The absorption of cadmium by shellfish was linear with time and no equilibrium was reached or decline in uptake rate observed after exposure for more than one month. Following removal from the cadmium exposure, the shellfish did not lose any of the accumulated cadmium after exposure to uncontaminated seawater for one month. Shellfish fed contaminated algae picked up the metal from their food, but the assimilation of cadmium via the food-chain concentration was small, averaging 10% of the cadmium content of the algae. The rate of accumulation of cadmium by humans feeding on a daily diet of 40 gm shellfish was calculated to obtain permissible levels of cad-mium in the effluent and dilution seawater. The suggested safe level of cadmium in dilution water for culture of oysters was .0002 ppm, .0015 ppm for culture of clams (Mercenaria mercenaria), and in effluent, was between .001 and .005 ppm cadmium, the exact concentration depending on the algae and shellfish species cultured. (See also W75-05277) (Jerigan-Vanderbilt)

TOXICITY OF ACID COAL-MINE SPOIL TO PLANTS,

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station. W. A. Berg, and W. G. Vogel.

N. A. Belg, and W. G. Yoga. In: Ecology and Reclamation of Devastated Land. Vol. 1. R. J. Hutnik, and G. Davis, editors. Gordon and Breach, New York, p 57-68, 1973. 3 fig, 4 tab,

Descriptors: *Strip mines, *Appalachian Mountain region, *Toxicity, *Soil chemical properties, Mulching, Leaching, Evaporation, Pine trees, Legumes, Plant physiology.

Toxicity of extremely acid coal-mine spoils to polants is caused primarily by excess soluble Mn and other metals, most probably Al. Manganese toxicity, expressed by chlorosis on the margins of legume leaves, and Al toxicity, expressed by stubby roots without laterals, was observed on herbaceous legumes, shrub lespedezas, and black locust grown from seed in extremely acid spoils. Spoil pH was useful in predicting Mn toxicity to the legumes, but water-soluble Mn extracted from the spoils was not. One year after extremely acid spoils were mulched with hardwood chips, the pH of the top 30 cm of spoil was raised while total soluble salts and water-soluble Al were reduced. Mulch is effective in enhancing the leaching of soluble toxic metals and acidic material by reducing the rate of evaporation. (Forest Service) W75-05591

EFFECTS OF STRIP MINING ON SMALL-STREAM FISHES IN EAST-CENTRAL KEN-TUCKY, Eastern Kentucky Univ., Richmond. Dept. of

Biology.

B. A. Branson, and D. L. Batch. Proceedings of the Biological Society of Washington, Vol 84, No 59, p 507-518, February 1972. 4 fig.

Descriptors: *Strip mines, *Appalachian Mountain region, *Sedimentation, *Fish reproduction, *Fish food organisms, Streams, Silting, Turbidity, Fish eggs, Minnows, Darters, *Kentucky, Water pollution effects.

A study was conducted on small mountain watersheds in eastern Kentucky to determine the effects of strip mining and subsequent sedimentation on fishes and bottom fauna. Following surface mining, fishes were found to be progressively eliminated from headwaters downstream. Benthic eliminated from headwaters downstream. Benunct food organisms were reduced in numbers and kinds by at least 90%. Reproduction in darters and minnows was curtailed by siltation, either by the prevention of mating or by kill-off of fry and eggs. One species of fish was found to be able to tolerate increased silt and turbidity. (Curtis-Forest Ser-W75-05598

STRIP-MINING, EROSION AND SEDIMENTA-

Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 3, p 434-436, 1971. 3 fig, 1 tab, 11 ref.

Descriptors: *Strip mines, *Appalachian Mountain region, *Erosion, *Sediment yield, *Streams, *Bed load, Weathering.

In Appalachia, land is being disturbed by strip mining at an alarming rate. The spoils left by strip mining represent a heterogeneous mixture of sandstone, shale, and soil. This freshly exposed unprotected material is subject to rapid weathering and erosion. Maximum sediment yields occur during active mining operations and also during large storms thereafter. Suspended sediment yields of over 46,000 ppm were observed from one watershed. Bedload amounted to 66,500 cubic feet per square mile of drainage area over a two-year period from another mined watershed. (Forest Service) W75-05600

ENDRIN IN FOREST STREAMS AFTER AERI-AL SEEDING WITH ENDRIN-COATED DOUGLAS-FIR SEED,
Forest Service (USDA). Corvallis Oreg. Pacific

Northwest Forest and Range Experiment Station. For primary bibliographic entry see Field 5B.

SOME ECOLOGICAL EFFECTS OF ARTIFI-CIAL CIRCULATION ON A SMALL EUTROPHIC LAKE WITH PARTICULAR EMPHASIS ON PHYTOPLANKTON. 1. KEZAR LAKE EXPERIMENT, 1968, New Hampshire Univ., Durham. Dept. of Zoolo-

Hydrobiologia, Vol 43, No 3-4, p 463-504, 1973. 7 fig, 5 tab, 96 ref. OWRR A-004-NH(7). FWPCA F1-WP-26, 461-01, 461-02.

Descriptors: *Algal control, *M *Eutrophication, *Lakes, Phytoplankton, *Mixing. Descriptors: Hampshire, Stratification, Heat budget, Optical properties, Nutrients, Secchi disks, Carbonates, Carbon dioxide, Hydrogen ion concentration, Conductivity, Nitrogen, Chlorophyll, Primary productivity, Phosphorus, Chlorophyta.

Identifiers: *Destratification, *Kezar Lake(NH), Aphanizomenon flos-aquae.

Summer blooms of filamentous blue-green algae occurred at the small eutrophic Kezar Lake, New Hampshire. A dense population of Aphanizomenon flos-aquae survived application of copper sulfate. After repetition of copper sulfate application, causing a fish kill, Aphanizomenon persisted in dense concentration. Seeking other methods of control, it was decided to modify the existing tertiary sewage treatment facility, but as an immediate step, to destratify the lake to increase water clarity. On the basis of data from the 1968 experiment, several conclusions are stated concerning the ecological effects of artificial circulation on Kezar Lake. The entire lake became isothermal due to warming and redistribution of cold bottom water, causing an increase in the heat budget. The stability of stratification was reduced to zero. Transparency increased after mixing. Artificial circulation ameliorated strong inverse clinograde distributions of Fe, Mn, and ammonia-N. A uniform, vertical distribution of the bloom-forming Aphanizomenon flos-aquae occurred. The large population of this alga began to die two weeks after the commencement of artificial circulation. After the bloom subsided the phytoplankton became dominated by chlorophycean taxa. Effects of artificial circulaby tion on the physical, chemical, and biological aspects of Kezar Lake are discussed. (Jones-Wisconsin) W75-05609

Effects Of Pollution—Group 5C

CHEMICAL AND RIOLOGICAL CONDITIONS OF LAKE OKEECHOBEE, FLORIDA, 1969-72, Geological Survey, Tallahassee, Fla. B. F. Joyner.

Florida Bureau of Geology, Tallahassee, Report of Investigations No 71, 1974. 94 p, 8 fig, 19 tab, 36 ref, append.

Descriptors: *Limnology, *Eutrophication, *Lakes, *Florida, Algae, Nutrients, Water quality, Water pollution sources, Water pollution effects. Identifiers: *Lake Okeechobee(Fla).

Nutrients were adequate in water in Lake Okeechobee, Florida, 1969-1972, for algal growth. Organic nitrogen averaged 1.3 mg/litre and accounted for approximately 86% of the total mitrogen; total phosphorus averaged 0.05 mg/litre. The average dissolved-solids content of the lake water was 288 mg/litre in 1969-72 compared to 190 mg/litre in 1940-41. Dilution and flushing from greater-than-average rainfall and use by algae decreased dissolved solids from 309 mg/litre in January 1969 to 210 mg/litre in April 1970, near the average value for the 1940-41 sampling. Rainfall contributes significant amounts of nutrients to the lake, and concentrations in rain are at times similar to concentrations in both the lake and its major tributaries. Rainfall contributes 30% of the total nitrogen and 21% of the total phosphorus load. Twenty-two percent of the nitrogen and 36% of the phosphorus entering Lake Okeechobee is retained within the bottom sediments and biota. Water from agricultural areas to the southeast is generally the poorest in quality of all water enter-ing the lake. Trace elements in the lake water are in low concentrations, but are usually adequate for sustaining healthy algal growth. Low concentrations of nitrite and ammonia indicate an absence of significant organic pollution. The number and variety of benthic organisms were well below levels normally considered indicative of highly eutrophic waters. Numbers of nuisance species were generally low. Algal growth may be inhibited by the relatively high turbidity of the lake. (Knapp-USGS) W75-05634

ANNUAL DYNAMICS OF VERTICAL DISTRIBUTION OF THE NUMBER OF HETEROTROPHIC BACTERIA IN SOUTHERN BAIKAL, (IN RUSSIAN),

E. A. Maksimova. Mikrobiologiya. Vol 42 No 3, p 530-536. 1973 Illus. (English summary).

Descriptors: *Bacteria, Lakes, Distribution.
Identifiers: *USSR(Lake Baikal), *Heterotrophic

The distribution of heterotrophic microorganisms in the layer of 0-700 m was studied during 1970 year in the region of the Baikal (USSR) biological station in the point located 3 km from the shore over the depth 700-800 m. Three layers in the dis-tribution of the heterotrophic bacteria were registered in the winter due to stable ecological con-ditions. The uniform distribution of the heterotrophic bacteria (4 cells/ml) throughout 700 m during the spring homothermy was detected. The maximal content of the heterotrophic bacteria during the year was registered in Nov. (72 cells/ml) at the depth of 200-500 m. A clear correlation was established between the maximal growth of the heterotrophic bacteria, dying off of the phytoplankton and the turbulence of waters. The heterotrophic bacteria of the pelagic and littoral zones of Baikal are represented by the values of the same order typical for oligotrophic lakes.—Copyright 1974, Biological Abstracts, Inc. W75-05636

THE DETECTION AND STUDY OF NITRIFICA-TION IN STREAMS AND ESTUARIES, Rutgers-the State Univ., New Brunswick, N.J. Dept. of Environmental Services. For primary bibliographic entry see Field 5A.

W75-05650

DISTRIBUTION OF AUTOTROPHIC NITRIFY. ING BACTERIA IN THE PASSAIC RIVER, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences. For primary bibliographic entry see Field 5B. W75-05663

A STUDY OF BENTHIC INVERTEBRATES IN LAGOON SYSTEMS IN THE SALT MARSHES OF NEW JERSEY, Rutgers - the State Univ., New Brunswick, N.J.

Dept. of Zoology.
For primary bibliographic entry see Field 2L. W75-05664

THE INFLUENCE OF EUTROPHIC LAKE SEDIMENTS ON THE GROWTH OF DIFFERENT PLANKTONIC ALGAE, Ceskoslovenska Akademie Ved, Prague. Ceskoslovenska Akademie Hydrobiologicka Laborator.

For primary bibliographic entry see Field 2H. W75-05689

LIFE-TERM EFFECTS OF NICKEL IN RATS: SURVIVAL, TUMORS, INTERACTIONS WITH TRACE ELEMENTS AND TISSUE LEVELS, Dartmouth Coll., Hanover, N.H. Dept. of

H. A. Schroeder, M. Mitchener, and A. P. Nason. Journal of Nutrition, Vol 104, No 2, p 239-243, February, 1974. 4 tab, 14 ref.

Descriptors: *Potable water, *Trace elements, *Nickel, *Rodents, *Animal metabolism, Animal physiology, Toxicity, Laboratory tests, Zinc, Manganese, Copper, Chromium, Cobalt, Distribution patterns.

In order to evaluate recondite toxicity of nickel, rats of both sexes were exposed to 5 ppm nickel in drinking water for life. The 104 rats given nickel and a control group containing 104 rats each received the following essential metals in water (ppm); zinc 50, manganese 10, copper 5, chromium 5, cobalt 1, molybdenum 1. There was some increased growth in the nickel-fed rats, but the metal was virtually innocuous, not affecting survival, longevity, incidence of tumors or specific lesions. Five organs were analyzed for zinc, copper, manganese, chromium, molybdenum and nickel by atomic absorption spectrophotometry. The feeding of nickel was associated with increased concentrations of chromium in heart and spleen, and manganese in kidney, and decreased copper in lung and spleen, zinc in lung, and manganese in een. Nickel did not accumulate in tissues. Uric acid levels in serum were unaffected. Nickel appeared to interact with all four of the essential trace metals studied. (Jernigan-Vanderbilt) W75-05691

GENETIC INFLUENCE ON RESPONSE TO MANGANESE DEFICIENCY

MICE, California Univ., Davis. Dept. of Nutrition. L. S. Hurley, and L. T. Bell.

Journal of Nutrition, Vol 104, No 1, p 133-137,

January, 1974. 3 tab, 18 ref.

Descriptors: *Manganese, *Diets, *Rodents, *Genetics, Biology, Laboratory animals, Laboratory tests, Animal pathology, Testing procedures, Microscopy, Nutrition.

The influence of the genetic background of mice on their response to manganese deficiency during prenatal development was investigated. Inbred strains of mice were used in addition to a mutant, pallid, and a four-way hybrid cross . Mice whose mothers were fed a purified diet containing vari-ous levels of manganese from the beginning of pregnancy were used as breeding females and their offspring were examined at birth for degree of otolith development. The results clearly showed that the genetic constitution of the animals affected their response to dietary deficiencies of manganese. Although in all genetic groups (except the mutant) there was a normal development of otoliths when the diet contained the normal control level of manganese, the response to low levels of the element varied considerably among the strains. Litter size was also increased when otoltith development was improved. The findings suggest that at low or borderline levels of dietary intake of essential nutrients the responses of individuals may vary greatly depending in part on their genetic background. (Jernigan-Vanderbilt) W75-05692

SEASONAL CHANGES IN CALCIUM, MAG-NESIUM, COPPER AND ZINC CONTENT IN THE LIVER OF THE COMMON FROG, RANA TEMPORARIA L.,
Oulu Univ. (Finland). Dept. of Anatomy.

S. Pasanen, and P. Koskela.

Comparative Biochemistry and Physiology, Vol 48A, No 1A, p 27-36, May, 1974. 1 fig, 2 tab, 20 ref

*Seasonal, *Frogs, *Metabolism, *Distribution, Animal physiology, Calcium, Magnesium, Copper, Zinc, Spring Summer, Autumn, Winter, Analytical techniques. Spring,

The values for calcium, magnesium, copper and zinc content calculated per unit weight were lowest during wintering and highest during the spring and summer, partly as a result of seasonal changes in the weight and water content of the liver. The total calcium, magnesium and zinc figures were highest during the summer and autumn due to feeding and rapid metabolism. Total copper remained practically constant throughout the year in the liver of the male, but in the female there is a clear spring maximum connected with egg-laving. Sex differences were found in the dry weight liver calcium and magnesium content during the summer, apparently due to the development of the ovaries. (Jernigan-Vanderbilt) W75-05693

NUTRITIONAL IRON DEFICIENCY AS A DETERMINANT OF HOST RESISTANCE IN THE RAT.

Harvard Medical School, Southboro, Mass. New England Regional Primate Research Center. R. B. Baggs, and S. A. Miller.

Journal of Nutrition, Vol 103, No 11, p 1554-1560, November, 1973. 5 fig, 4 tab, 30 ref.

Descriptors: *Iron, *Diets, *Rodents, *Animal pathology, Laboratory animals, Laboratory tests, Toxicity, Bacteria, Animal physiology.

The response to infection with Salmonella typhimurium was studied at 42 days in rats fed various levels of dietary iron. Rats fed iron-deficient diets after weaning were more susceptible to challenge with S. typhimurium, with the greatest morbidity and mortality observed in the marginally deficient animals. Preweaning iron deficiency decreased the rats' ability to resist the stress of infection, even if a period of nutritional rehabilitation intervened. The iron-deficient rats had fewer myeloperoxidase (MPO)-containing cells in the lamina propria and submucosa. Phagocytes isolated from the peritoneal cavity of iron-deficient rats were as capable of exerting a bactericidal influence on Salmonella in vitro as are cells isolated from iron-adequate animals. Iron-deficient rats appear unable to produce MPO-containing cells in sufficient quantity to withstand the stress of infec-tion. (Jernigan-Vanderbilt)

Group 5C-Effects Of Pollution

EFFECT OF DIETARY SELENIUM ERYTHROCYTE AND LIVER GLUTATHIONE PEROXIDASE IN THE RAT,

Wisconsin Univ., Madison. Dept. of Biochemistry. D. G. Hafeman, R. A. Sunde, and W. G. Hoekstra. Journal of Nutrition, Vol 104, No 5, p 580-587, May, 1974, 3 fig, 2 tab, 25 ref.

Descriptors: *Trace elements, *Diets, *Rodents, *Animal physiology, Enzymes, Laboratory animals, Laboratory tests, Vitamins. Identifiers: *Selenium.

Experiments were conducted with male rats to quantitate the relationship between dietary selenium intake and the amount of the enzyme glutathione peroxidase (GSH-Px) in erythrocytes and liver. Weanling male rats were fed torula yeast-based diets with 0, 0.05, 0.1, 0.5, 1.0, or 5.0 ppm Se supplement as sodium selenite. Liver GSH-Px fell to undetectable levels (less than 1% of that found in the weanling rats) within 24 days in the 0 ppm Se group; feeding 0.1 ppm Se or greater caused liver GSH-Px to increase above that found in the weanling rats. The erythrocyte GSH-Px response to lack of dietary Se was somewhat smaller in magnitude and more gradual; however, only 21% of initial erythrocyte GSH-Px activity remained in the unsupplemented group after 66 days. Increased dietary Se resulted in corresponding increases of erythrocyte GSH-PX activity. Resupplementation with 0.1, 0.5, or 5.0 ppm Se elevated th depressed erythrocyte GSH-Px levels of the deficient rats. Increased dietary Se provided for both faster elevation and higher maximal GSH-Px activity within 60 to 90 days after resupplementation (Jernigan-Vanderbilt) W75-05697

PHYTOPLANKTON BLOOM IN THE LAGOON OF VENICE,

Istituto di Biologia del Mare, Venice (Italy) For primary bibliographic entry see Field 2L. W75-05699

RESPONSE IN VITAMIN B-12 PRODUCTION AND ABSORPTION TO INCREASING COBALT INTAKE IN THE SHEEP, Cornell Univ., Ithaca, N.Y. Dept. of Animal

Science.

M. F. Hedrich, J. M. Elliot, and J. E. Lowe. Journal of Nutrition, Vol 103, No 12, p 1646-1651, December, 1973. 4 tab, 19 ref. USPHS (AM

Descriptors: *Cobalt, *Vitamins, *Mammals, *Absorption, *Diets, Laboratory animals, Animal physiology, Laboratory tests, Spectroscopy. Identifiers: Sheep.

Three sheep, fitted with intestinal reentrant and rumen cannulas, were used to estimate ruminal production of vitamin B-12 when fed diets differing in cobalt concentrations. The basal diet contained 30% ground corn, 69% ground hay and 1% sodium chloride. At daily cobalt intakes averaging 0.047, 0.41 and 0.83 mg, mean estimates of vitamin B-12 production were 37, 1006, 1553 micrograms, respectively a significant (P less than 0.05) treat-ment effect. Multiple regression analysis of the data from this and other experiments employing the same techniques indicated that more than onehalf of the observed variation in vitamin B-12 production estimates was accounted for by variations in the cobalt intake, percentage roughage in diet and digestable dry matter intake. The multiple regression was highly significant (P less than 0.01). Data from two sheep on apparent absorption from the small intestine were combined with data from other trials to study the effects of duodenal B-12 flow (production), rate of ileal digesta flow, and relative proportion of Ochromonas-active B-12 in duodenal B-12 activity as measured by radioassay. A highly significant (P less than 0.01) multiple regression equation accounting for 57% of the ob-served variation in apparent absorption was computed. (Jernigan-Vanderbilt)

W75-05700

RELATIONSHIP OF CALCIUM TO RELATIONSHIP OF CALCIUM TO REPRODUCTIVE ABNORMALITIES IN THE LAYING HEN (GALLUS DOMESTICUS), Florida Univ., Gainesville. Dept. of Poultry

D. A. Roland, Sr., D. R. Sloan, H. R. Wilson, and

R. H. Harms. Journal of Nutrition, Vol 104, No 8, p 1079-1085, August, 1974. 9 tab, 23 ref.

Descriptors: *Calcium, *Poultry, *Reproduction, Diets, Laboratory tests, Laboratory animals, Animal physiology, Testing procedures, Nutrition.

A reduction in weight of ovary, oviduct and body and a decrease in egg production and feed consumption were observed in hens fed a diet containing 0.05% calcium. Adenohypophyses of calcium-deficient hens had increased amounts of periodic contains the periodic contains a contain a conta acid-Schiff-positive material (secretory in nature) indicating that hormones were produced but not released. Luteinizing hormone and adenohypophysis extract increased soft-shell egg production of calcium-deficient hens approximate-ly 200 to 300% compared to that of calcium-defi-cient hens injected with physiological saline. The injection of hypothalamus extracts into birds fed a diet containing 0.05% calcium increased soft-shell egg production approximately 300 to 400% and also significantly increased ovary and oviduct weight and significantly decreased bone ash. Hormonal injections had no significant influence on soft-shell egg production in birds fed a diet containing 3.00% calcium. The results suggest that the secretion or production of production of gonadotropic hormones was reduced with prolonged calcium deficiency resulting in adverse effects on the reproductive system of laying hens. The ability of hypothalamus extract to stimulate the reproductive system suggests that calcium is involved in the production or release of releasing factors from the hypothalamus. (Jernigan-Vanderbilt) W75-05703

WORKERS' DEATHS POINT TO EXPOSURE

TO ARSENICS, Chemical and Engineering News, Vol 52, No 36, p 4, September 9, 1974.

Descriptors: *Arsenic compounds, *Toxicity, *Public health, Human pathology, Salts, Inorganic compounds, Pesticides, Industrial wastes. Identifiers: Cancer.

The effects of arsenic to exposed workers at vari-ous chemical producing plants were discussed. Dow Chemical and Allied Chemical reported to the Occupational Safety and Health Administra-tion high rate of death due to cancer among workers exposed to arsenic and its inorganic salts. Epidemiological studies conducted by both com-panies on deaths of persons employed in two pesticide plants revealed a greater than normal in-cidence of cancers involving the lung and lymphatic systems. Although about 14 companies make inorganic arsenics, government sources esti-mate that as many as 1.5 million U.S. workers may be exposed to varying amounts of the chemicals. Public hearings have been scheduled by OSHA to obtain further information on the toxicity of inorganic arsenics, their carcinogenic properties, and the number of workers potentially or actually ex-posed to them. (Jernigan-Vanderbilt) W75-05705

IRON ABSORPTION BY HUMANS FROM VEAL

Instituto Venezolano de Investigaciones Cientificas . Caracas.

C. Martinez-Torres, I. Leets, M. Renzi, and M.

Layrisse.
Journal of Nutrition, Vol 104, No 8, p 983-993, August, 1974. 1 fig, 7 tab, 28 ref.

Descriptors: *Iron, *Absorption, *Human pathology, *Foods, Laboratory tests, Chelation, Chemical reactions, Public health.

Iron absorption from veal liver was tested in 74 human subjects. The geometrical mean absorption was 11% in normal subjects, but increased up to 20% in subjects with moderate iron deficiency and to 30% in subjects with marked iron deficiency. The total geometrical mean absorption in both normal and iron-deficient subjects was 20%. Veal liver iron absorption was not affected by ascorbic acid but there was a marked reduction in absorp-tion when the food was administered with desferrioxamine. This chelating agent may affect the ab-sorption of ferritin and perhaps hemosiderin. In-teraction of veal liver and maize in the lumen of the gut results in an enhancement of the absorp-tion of vegetable iron and a reduction of the ab-sorption of liver iron. Liver is the best food in terms of nutritive iron value because of its high iron content, its high absorbability and its effect on the absorption of vegetal iron. With the exception of meat, its absorption is higher than the iron absorption from vegetal and other animal foods, even when it is administered with vegetables. (Jernigan-Vanderbilt) W75-05706

AVAILABILITY OF ZINC FROM PEA SEEDS

Agricultural Research Service, Ithaca, N.Y. Plant, Soil and Nutrition Lab.

R. M. Welch, W. A. House, and W. H. Allaway. Journal of Nutrition, Vol 104, No 6, p 733-740, June, 1974. 2 fig, 5 tab, 39 ref.

Descriptors: *Zinc, *Seeds, *Rodents, Laboratory tests, Laboratory animals, Tracers, Radioisotopes, Absorption, Foods, Diets, Plant physiology, Seed treatment.

Experiments were conducted to determine the ef-Experiments were conducted to determine the effects of endogenous phytic acid in pea seeds on the availability of Zn-65 in the seeds to Zn-depleted rats. Seeds were harvested at two stages of maturation from plants supplied with either 0.066 or 0.262 ppm Zn. Increasing Zn supply to growing plants increased the amount of Zn in the seeds. The phytic acid content of immature and mature seeds was 0.17 and 1.23% dry weight, respectively. Most of the Zn in the seeds was in the form of a soluble, small anionic complex (less than 1000 mol wt) and did not anpear to be present than 1000 mol wt) and did not appear to be present as a Zn-phytate complex. When rats were fed seeds at the same stage of development, the efficiency of Zn absorption by rats was not influenced significantly by the level of Zn in the seeds. Although the absorption by rats of Zn from mature seeds was significantly lower than that from immature seeds, both seed types appeared to be good dietary sources of Zn. In addition, cooking the seeds did not affect the availability of Zn to rats. It was concluded that phytic acid in mature pea seeds was not solely responsible for the decreased availability of Zn in seeds to Zn-depleted rats. (Jernigan-Vanderbilt) W75-05707

EFFECT OF ZINC REPLETION LATE IN GES-TATION ON PARTURITION IN THE ZINC-DEFICIENT RAT, Agricultural Research Service, Ithaca, N.Y. Plant,

Soil and Nutrition Lab. J. Apgar.

Journal of Nutrition, Vol 103, No 7, p 973-981, July, 1973. 3 fig, 5 tab, 11 ref.

Descriptors: *Zinc, *Rodents, *Laboratory animals, *Laboratory tests, Animal physiology, Toxicity, Stress, Nutrition, Distribution patterns.

Experiments were done to determine how late in gestation zinc could be given to Zn deficient female rats and result in normal parturition. A low zinc diet (less than 1 ppm) was given adult females

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beginning day one of pregnancy. Late in pregnancy, a single dose of either 15 or 30 mg zinc acetate was given by stomach tube. Females were killed six hours after the birth of the first pup; and organ weights, tissue zinc concentrations, and adrenal cholesterol were determined. Repletion with zinc on day 15, 18 or 19 resulted in essentially normal parturition although many of the females given zinc day 18 or 19 eventually ate the pups. Administration of zinc on day 20 or 21 enabled some, but not all, of the females to deliver reasonably normally. Females given zinc on day 22 were as stressed as the zinc-deficient controls. Concentrations of zinc in maternal liver and in the pup were generally higher the later repletion was begun. Serum and liver zinc levels after parturition in females given a single dose of zinc on day 18 were not significantly different from levels in zinc-deficient females. These experiments indicated that the critical time for administering zinc in order to prevent stressful parturition in the zinc-deficient rat is between day 19 and 21. (Jernigan-Vanderbilt) W75-05708

EXPERIMENTAL STUDY OF THE ACCUMU-LATION OF SILVER 110M IN VARIOUS LATION OF SILVER 110M IN VARIOUS MARINE ORGANISMS, (ETUDE EXPERIMEN-TALE DE L'ACCUMULATION DE L'ARGENT 110M CHEZ DIVERS ORGANISMES MARINS), For primary bibliographic entry see Field 5A. W75-05711

DETERMINATION OF POLLUTION PARAME-TERS (CONCEPTO DE PARAMETROS A DETERMINAR), POLUCION, J. G. Catalan.

Investigacion y Tecnica del Papel, Vol 11, No 40, p 355-366, April, 1974.

Descriptors: *Water pollution, *Water pollution effects, Water quality, Water properties, Biologi-cal properties, Chemical properties, Physical pro-perties, Color, Odor, Taste, Temperature, Suspended solids, Radioactivity, Foaming.

Several definitions of pollution are given, and the effects of pollution on the biological, chemical, and physical properties of water (color, odor, taste, temperature, suspended solids, radioactivity, and foaming) are discussed. (Sykes-IPC) W75-05725

REPORT ON MOOSEHEAD LAKE, PISCATAQUIS AND SOMERSET COUNTIES, MAINE.

Pacific Northwest Environmental Research Lab.,

Corvallis, Oreg. EPA National Eutrophication Survey, Working Paper No 2, May 1974. 47 p, 1 fig, 5 ref, 3 append.

*Maine, Descriptors: *Watersheds(Basins), Water quality, Nutrients, Dissolved oxygen, Chlorophyll, Oligotrophy, Phosphorus, Nitrogen, Septic tanks, Waste treatment, Water pollution control, Trophic level, Tributaries, Physicochemical properties, Lake morphometry, Biological communities, Limiting

Identifiers: *Moosehead Lake(Maine), Nutrient sources, STORET 2309.

High water clarity and dissolved oxygen values observed in association with low nutrient levels and chlorophyll-a concentrations are indicative of an oligotrophic conditions in Moosehead Lake. Algal assay results and nutrient concentration ratios indicate Moosehead Lake was phosphorus limited. However, nutrient spiked subsample growth yields suggest nitrogen limitation would occur with an approximate two fold increase in orthophosphorus concentration. Other than septic tank seepage, there are no known point source discharges to the drainage basin. A grant has been awarded for construction of a collection system and tertiary treatment plant to serve the villages of Greenville and Greenville Junction. Although plant effluent will be discharged to the lake, the required combination of high treatment and phosphorus removal should not compromise Moosehead Lake water quality. Over 99% of calculated phosphorus and nitrogen loadings can be attributed to non-point sources. The Moose River, draining approximately 63% of the total lake watershed, contributes 40.1% of the total phosphorus and 43.1% of total nitrogen. Notwithstanding the percentage attributable to this and other areal sources, comparison observed phosphorus loading rates with the Vollenweider roadel indicate no apparent threat to research model indicate no apparent threat to present trophic conditions. (Jones-Wisconsin)

REPORT ON ESTES LAKE, YORK COUNTY,

Pacific Northwest Environmental Research Lab.,

Corvallis, Oreg. EPA National Eutrophication Survey, Working Paper No 3, May 1974. 32 p, 1 fig, 5 ref, 3 append.

Descriptors: *Lakes, *Maine, *Trophic level, Eutrophication, Chlorophyll, Nutrients, Nitrogen, Phosphorus, Water quality, Watersheds(Basins), Limiting factors, Water pollution control, Lake morphometry, Tributaries, Physiocochemical properties, Biological communities.
Identifiers: *Estes Lake(Me), York County(Me),
Nutrient sources, STORET 2304.

Estes Lake is an impoundment, atypical of the natural lakes and ponds in Maine. Survey data indicate it is eutrophic. Chlorophyll-a values were extremely high, Secchi disc values were low, and nutrient concentrations were rather high. Data obtained in 1954 indicate it was then free of aquatic nuisance conditions, however, more recent studies show it experiencing frequent and heavy blooms of nuisance algae, excessive aquatic weed growth, and depletion of dissolved oxygen in the deeper areas. Algal assays show that is was nitrogen limited at the time the sample was collected, and nitrogen limitation is indicated for the other sampling periods. During the survey year, the Sanford waste treatment facility contributed about 74% of the total phosphorus loading. A substantial reduc-tion of phosphorus from this source should result in improved lake water quality. Nitrogen loading from diffuse sources is calculated to be nearly 75% of the total, while only one-fourth of the total phosphorus is contributed from non-point sources. Because non-point phosphorus loading alone expecause non-point phosphorus loading alone ex-ceeds Vollenweider's predicted 'permissible' level, reduction of areal contributions could also be expected to yield improved water quality. (Jones-Wisconsin) W75-05729

REPORT ON LONG LAKE, CUMBERLAND COUNTY, MAINE.
Pacific Northwest Environmental Research Lab.,

Corvallis, Oreg.
EPA National Eutrophication Survey, Working
Paper No 4, May 1974. 34 p, 1 fig, 7 ref, 3 append.

Descriptors: *Lakes, *Maine, *Water pollution control, Watersheds(Basins), Water quality, Nutrients, Mesotrophy, Phosphorus, Nitrogen, Waste treatment, Trophic level, Tributaries, Physicochemical properties, Lake morphometry, Biological communities, Limiting factors.
Identifiers: *Long Lake(Maine), Cumberland
County(Maine), Nutrient sources, STORET 2306.

The first stage of evaluation of Long Lake, its watershed data, and its drainage basin, is reported. It provides state environmental agencies with specific information for basin planning, water quality criteria/standards review, clean lakes, and water quality monitoring activities. Survey data indicate Long Lake is mesotrophic. Algal assay results indicate phosphorus was the limiting nutrient at the time the assay sample was collected. A regional waste collection and treatment system is planned to serve the communities of Bridgeton and Harrison and dwellings along the lake's west side. When this facility becomes operational it is estimated that the phosphorus loading from this source alone will exceed the existing phosphorus loading to Long Lake from all sources. It is concluded that phosphorus removal at the regional treatment facility will be required to protect Long Lake and other lakes in the Presumpscot River chain. Non-point sources phosphorus loading entering through tributaries or direct runoff presently amounts to 77.5% of the total (65.7% for N); however, these figures include substantial contributions from unsewered wastes by west shore communities. Incorporation of these discharges into the proposed regional facility will reduce non-point impact. (Jones-Wisconsin)

REPORT ON BAY OF NAPLES AND SEBAGO LAKE, CUMBERLAND COUNTY, MAINE, Pacific Northwest Environmental Research Lab.

Corvallis, Oreg. EPA National Eutrophication Survey, Working Paper No 5, May 1974. 49 p, 2 fig, 7 ref, 3 append.

Descriptors: *Lakes, *Maine, *Trophic level, Fish, Recreation, Salmon, Water supply, Oilgotrophy, Phosphorus, Water quality, Watersheds(Basins), Nitrogen, Limiting factors, Water pollution control, Lake Morphometry, Tributaries, Physiocochemical properties, Biological communities, Water pollution sources, Biologi-cal communities, Water pollution sources, Treat-ment facilities, Runoff. Identifiers: "Bay of Naples(Me), "Sebago Lake(Me), Nutrient sources, STORET 2311.

The Bay of Naples supports numerous kinds of fish, both cold- and warm- water species. Sebago Lake, deepest lake in Maine, is suitable for salmon management. Based on data collected during the survey, the Bay of Naples and Sebago Lake are considered to be oligotrophic. Results of algal asays indicate that phosphorus was limiting in both lakes at the time the assay sample was collected. The only point sources of nutrients that can affect the Bay of Naples and Sebago Lake are those impacting Long Lake just upstream in the Presump-scot River chain. Inclusion of phosphorus removal at the planned regional waste treatment facility at Long Lake would minimize the effect of the phosphorus source on these two lakes. Over 75% of the calculated phosphorus and nitrogen loading to each lake comes from surface runoff. At present, septic tank contributions to both lakes are not believed to be significant. However, com-parison of total P loading with the Vollenweider model suggest that slight increases may result in water quality degradation. Thus, as lakeshore and watershed development progresses to meet in-creasing recreational needs, reevaluation of dif-fuse phosphorus sources should be made. (Jones-W75-05731

REPORT ON RANGELEY LAKE, FRANKLIN COUNTY, MAINE,
Pacific Northwest Environmental Research Lab.,

Corvallis, Oreg.
EPA National Eutrophication Survey, Working
Paper No 6, May 1974. 37 p. 1 fig. 7 ref, 3 append.

Descriptors: *Lakes, *Maine, *Trophic level, Lake fisheries, Cold-water fish, Recreation, Water storage, Septic tanks, Sewage treatment, Storm drains, Oligotrophy, Phosphorus, Watersheds(Basins), Limiting factors, Water pol-Storm lution control, Lake morphometry, Tributaries, Physiocochemical properties, Treatment facilities, Biological communities. Identifiers: *Rangeley Lake(Me.), Franklin Coun-

ty(Me.), Nutrient sources, STORET 2310.

Rangeley Lake is famous for its cold-water game fishery. The region is rapidly developing for

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recreational purposes, with much of the shoreline containing camps and homes. Most of these are served by septic tanks, although reportedly the soil does not provide adequate absorption of tank effluents. While the lake receives no industrial discharges, it does receive secondary effluent from the Rangeley wastewater treatment plant via Haley Pond, and a nutrient load of unknown magnitude is contributed directly by Rangeley storm sewers. Survey data indicate it is oligotrophic. Algal assay results and lake data show that Rangeley Lake was phosphorus limited when sampled. During the sampling year, about 78% of the total phosphorus load was contributed by nonpoint or areal sources, while the community of Rangeley was contributing about 15%, and camp/home septic tanks were estimated to have contributed about 7%. Construction of 95% phosphorus removal facilities at Rangeley is scheduled in 1974 which should help preserve the lake's present excellent quality. At present, septic tank contributions may not be a problem. However, as lakeshore development progresses, consideration should be given to the control of these nutrient sources. (Jones-W75-05732

REPORT ON LONG LAKE, AROOSTOOK COUNTY, MAINE,
Pacific Northwest Environmental Research Lab...

Corvalls, Oreg. EPA National Eutrophication Survey, Working Paper No 7, May 1974. 31 p, 1 fig, 4 ref, 3 append.

Descriptors: *Lakes, *Maine, *Trophic level, Salmon, Trout, Lake Fisheries, Cold-water fish, Recreation, Watersheds(Basins), Irrigation, mon, Trous, Lake Transparent Mecreation, Watersheds (Basins), Irrigation, Nutrients, Chlorophyll, Septic tanks, Phosphorus, Treatment facilities, Mesotrophy, Nitrogen, Limiting factors, Water pollution control, Lake morphometry, Tributaries, Physicochemical pro-perties, Biological communities, Water pollution

Identifiers: *Long Lake(Me), Nutrient sources, STORET 2313.

Long Lake, Aroostook County, is considered on of the best cold-water lakes in northern Maine for fish management, and water quality isi considered to be ideal for landlocked Atlantic salmon and brook trout. In addition to recreation the lake is utilized for irrigation. The low levels of primary nutrients and low yield of the algal assay, as ob-served, and deep water oxygen depression re-ported by Maine agencies indicate the lake is mesotrophic. The algal assay indicates that Long Lake was phosphorus limited at the time the sample was collected, field data also indicate phosphorus limitation. Other than septic tanks, the only point source of nutrients to Long Lake is the St. Agatha Sanitary District waste treatment facility. Phosphorus removal at this source is not expected to result in any observable change in trophic condition of Long Lake. Export of nitrients from diffuse sources represent over 85% of calculated total nitrogen and phosphorus loadings. In view of the proximity of present phosphorus loading rates to the predicted 'permissible' limits, continued assessment of cultural practices within the Long Lake watershed should be maintained. (Jones-Wisconsin) W75-05733

REPORT ON MATTAWAMKEAG LAKE, AROOSTOOK COUNTY, MAINE, Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
EPA National Eutrophication Survey, Working
Paper No 8, May 1974. 37 p, 1 fig, 5 ref.

Descriptors: *Lakes, Maine, *Trophic level, Waterhseds(Basins), Lake fisheries, Nutrients, Bass, Perches, Pikes, Humic acids, Light penetration, Mesotorphy, Nitrogen, Phosphorus, Sewage effluents, Limiting factors, Water pollution control, Lake Morphometry, Tributaries,

Physiocochemical properties, Biological communities, Water pollution sources.

Identifiers: *Mattawamkeag Lake(Me), Nutrient sources, STORET 2308.

Mattawamkeag is a relatively shallow warmwater lake and provides an excellent habitat for smallmouth bass, white perch, and chain pickerel. Except for a few summer cottages, shoreline development is minimal. Reportedly, the lake is consistently strongly humic colored with platinum scale values around 70 ppm. The color limits light penetration to a degree and may account in part for the quite low chlorophyll-a measured during the survey. Low nutrient concentrations and chlorophyll-a in conjunction with summer depression of dissolved oxygen in the hypolimnion signify a mesotrophic condition. The lake data show that the lake was nitrogen limited at the time the assay sample was collected by phosphorus limited the other two sampling times. Provision of secondary wastewater treatment at the communities of Patten and Island Falls would result in sufficient phosphorus reduction to protect Mattawamkeag Lake, as indicated by a comparison of survey data with the Vollenweider model. Areal contribution of primary nutrients is relatively low for phosphorus (42.4% of total P), while rather high for nitrogen (77.3% of total N). (Jones-Wisconsin) W75-05734

INGESTION AND ASSIMILATION RATES OF CHESAPEAKE BAY PRELIMINARY REPORT. ZOOPLANKTON: Johns Hopkins Univ., Baltimore, Md. Chesapeake

S. E. Storms, and W. R. Taylor.
In: The Ecology of the Plankton of the Chesapeake Bay Estuary, Progress Report July 1, 1973
- July 31, 1974. 43 p, 12 fig, 6 tab, 12 ref.

*Chesapeake Descriptors: *Plankton, *Energy transfer, Primary productivity, Secondary productivity, Grazing, Standing crops, Phytoplankton, Zooplankton, Cycling nutrients, Digestion, Copepods, Estuaries. Identifiers: Acartia tonsa, Acartia clausi.

The impact of copepod grazing, not only on the total phytoplankton standing crop in Chesapeake Bay, but also on the different size classes of phytoplankton within the total standing crop was assessed. The assimilation rates of Acartia tonsa and A. calusi and other major components of the and A. Catusi and other major components of the zooplankton were measured while feeding on natural concentrations of N-15 labeled phytoplankton. Values of particulate organic carbon available as phytoplankton ranged from a low of 0.27 mg C/l in August to a high of 2167 mg C/l in April. The mean organic carbon for all stations was also lowest in August (0.85 mg C/l) and highest in April (1.36 mgC/l) while the mean value for particulate organic carbon for all stations was 0.09 C/l. Total ingestion rate for all sizes of phytoplankton cells 2 to 35 micrometer in diameter for Acartia varied from a low of 7.0 mg C/animal/hr in June to a maximum of 288 mg C/animal/hr in October. The mean value for ingestion rates for all stations was 84 mg C/animal/hr, which would indicate that Acartia ingests approximately 100% of its bodily carbon content per day. Based on a mean Acartia concentration at ten animals/liter, 2% of the available carbon is ingested per day. (Auen-Wisconsin)

PHOSPHORUS CYCLING IN THE PLANKTON OF CHESAPEAKE BAY, Johns Hopkins Univ., Baltimore, Md. Chesapeake

Bay Inst.

Jay 183.

J. L. Taft, and W. R. Taylor.

In: The Ecology of the Plankton of the Chesapeake Bay Estuary, Progress Report July 1, 1973

- July 31, 1974. 203 p, 37 fig, 18 tab, 109 ref.

Descriptors: *Phosphorus, *Cycling nutrients, *Chesapeake Bay, Estuaries, Phosphorus compounds, Phytoplankton, Zooplankton, Productivi-

Phoshorus distribution in the Chesapeake Bay and the cycling rates of four phosphorus fractions in the euphotic zone are described. Total phosphorus in this zone varied on an annual cycle with the peak values in late summer and early fall. The phosphorus source for the summer increase is the bottom where bacterial activity results in remineralization of inorganic phosphate from organic matter. Phytoplankton are the principal consumers of inorganic phosphate in the open water of the Bay. Bacteria and detritus are insignificant components of the particulate fraction. Low phosphate concentrations and rapid phosphorus cycling in the euphotic zone prevailed from December 1972 through August 1973. The dissolved organic phosphorus pool is composed of a large, stable fraction and a small, kinetically active fraction of phosphorus monoesters. The Bay's phytoplankton have the capability to hydrolyze phosphate monoesters and incorporate the liberated inorganic phosphate. The rate of phosphorus cycling between zooplankton and phytoplankton in the euphotic zone is determined by the rate of phosphorus release from the zooplankton. It is postulated that the rate of orthophosphate availability to the Bay phytoplanktion was equivalent to the rate of orthophosphate release from zooplankton which are smaller than the copepods tested. (Auen-Wisconsin) W75-05736

DIEL PERIODICITY IN UPTAKE OF NITRATE AND NITRITE BY RESERVOIR PLANKTON, Oklahoma State Univ., Stillwater. Dept. of Zoolo-

Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as ORO-425 424. Contribution 503, 1974. 13 p, 4 fig, 8 ref. AEC AT(40-1)-4254

Descriptors: *Biorthyms, *Diurnal, *Adsorption, *Nitrates, *Nitrites, Reservoirs, Plankton, Irrida-tion, Primary productivity, Oklahoma, Cycles. Identifiers: Lake Carl Blackwell(Okla).

Observations on diel uptake of nitrate and nitrite by reservoir plankton are described and patterns of uptake are related to concomitant changes in temperature, irradiance and nutrient concentrations. Observations were made on uptake in Lake Carl Blackwell, Oklahoma, at the surface, 0.5 m, and 2 m on August 3-4, 1971, and at 0.5 m on June 29-30, 1972. Samples were obtained with a non-toxic water sampler at 4-9 hr intervals and were analyzed with a mass spectrometer. Diel periodicity in the uptake of nitrate and nitrite occurs in reservoir plankton. The time course of changes in the rate of uptake paralledled changes in irradiance. However, at 0.5 m where nitrate uptake rates were maximum, uptake of nitrate accelerated during the course of the day, and then dropped abruptly with the onset of darkness. Periodicity in nitrate uptake needs to be considered in models of primary production where nitrogen is the limiting nutrient. Light is clearly involved in nitrate uptake, but diel changes in the rate of uptake do not always exactly parallel diel changes in irradiance. (Jones-Wisconsin) W75-05739

EFFECT OF PHOSPHORUS AND POTASSIUM ON PHYTOPLANKTON POPULATIONS IN FIELD ENCLOSURES,
Agricultural Research Service, For Lauderdale,

W. H. Ornes, and K. K. Steward. Available from the National Technical Information Service Springfield Va 22161 as PB-231 650, \$3.25 in paper copy, \$2.25 in microfiche. Ecological Report No DI-SFEP-74-07, May 1973. 14 p. 4

Descriptors: *Plant populations, *Phosphorus, *Potassium, *Phytoplankton, Waste water treatment, Nutrients, Marshes, Biological communities, Eutrophication, Chara, Dominant organisms, Aquatic plants, Succession.
Identifiers: *Everglades(Fla), Sawgrass, Utricu-

Some of the parameters involved in the addition of nutrients to a marsh environment are evaluated. The effect of weekly applications of phsophorus and potassium on algal populations in artifically isolated segments of a natural marsh environment was monitored. Applications were made to field enclosures for 22 weeks. The treatment rates were equivalent to the quantities contained in 2.5 cm/ha of sewage effluent with a concentration of 10 mg/liter P and 20 mg/liter K. The rates were arbitrarily chosen and were similar to rates recom-mended for terrestrial application. Phytoplankton blooms and dynamic shifts in domonant phytoplankton genera resulted. Also, the aquatic macrophytes Chara and Utricularia disappeared after 22 weeks of treatment. Both polluted and clean water phytoplankton genera appeared in the control and treated enclosures. The experiment results indicated a disrupted environment. More study should be conducted before utilizing the sawgrass marshes as living filters for wastewater. es-Wisconsin) W75-05741

A MATHEMATICAL MODELLING OF LAKE ECOLOGICAL SYSTEMS, V. V. Menshutkin.

Mitteilungen Internationalen Vereiningung Lim-nologie, Vol 18, Part 3, p 1843-1850, 1973. 4 fig, 1

Descriptors: *Management, *Mathematical models, *Lakes, Systems analysis, Energy budget, Predation, Spatial distribution, Seasonal, Biomass, Fish, Productivity.
Identifiers: Lake Drivjato(USSR).

A mathematical model of an ecosystem should be based on data of theoretical limnology which describes general regularities in lake processes., and on specific data reflecting the state of a given ecosystem. The development of a control action can be done either in terms of the theory of optimum management, e.g., by dynamic pro-gramming, or by game theory methods. Mathe-matical models which take into account the circulation of matter allow consideration of not only trophic but also spactial structures of ecosystems. A flow chart is shown of the model with allowance for a vertical subdivision of the lake into epi- and hypolimnion. The introduction of the turbulent exchange coefficient varying with time enables simulation of the formation of spring and autumn maxima of phytoplankton biomass. Consideration of the vertical distribution of dissolved oxygen, with allowance for photosynthesis and respiration makes possible the modeled study of mass death es caused by oxygen deficiency and oxygen hysteresis. The types of mathematical models given can serve as a basis for better understanding and management of natural ecosystems provided that only realistic values and relations are utilized in building such models. (Jones-Wisconsin) W75-05744

OF TEMPERATURE ON THE MINERALIZATION OF ORGANIC
PHOSPHORUS COMPOUNDS BY CERTAIN AQUATIC BACTERIA, W. Reihardt.

Mitteilungen Internationalen Vereiningung Lim-nologie, Vol 18, Part 3, p 1277-1286, 1973. 6 fig, 4 tab, 9 ref.

Descriptors: *Water temperature, *Hydrolysis, *Phosphorus, *Aquatic bacteria, Eutrophication, Growth rates, Myxobacteria.

Identifiers: Germany, Flavobacterium, Sporocytophaga cauliformis.

A mass population of only one bacterial species occurring in a lake at low water temperatures was an ideal object to study the influence of temperature on both growth rates and enzymatic activities of phosphate hydrolysis. Yellow pigmented bac-teria chiefly consisting of Flavobacterium species and nonfruiting myxobacteria have been observed as an essential constituent of bacterioplankton in lakes. In eutrophic Mendel Lake (near Constance, Germany) aerobic myxobacteria of allocthonous origin had produced a bacterial waterbloom which persisted longer than two months. Isolated strains did not form fruiting bodies under the employed culture conditions and were in most features identical to Sporocytophaga cauliformis. These bacteria did not only grow at 0C but had a continuous optimum for growth below 20C. Producing an overplus of alkaline phosphatases they had a marked effect on hydrolysis of phosphates. In spite of their psychrophilic habit synthesis of alkane phosphatases did not vary at different growth temperatures, and optimum activities were found near 36C. Pure culture experiments were undertaken to estimate catalytic efficiencies of phosphate mineralization which could be attributed to standing crops of Myxobacteria in lake water. (Jones-Wisconsin) W75-05745

BENTHOS PRODUCTION OF A HIGH-MOUN-TAIN LAKE: NEMATODA, G. Bretschko.

Mitteilungen Internationalen Vereiningung Limnologie, Vol 18, Part 3, p 1421-1428, 1973. 7 fig, 1

Descriptors: *Benthos, *Productivity. *Nematodes, *Lakes, Elevation, Benthic fauna, Diptera, Crustaceans, Protozoa, Oligochaetes, Distribution patterns, Dominant organisms, Identifiers: Vorderer Finstertalersee(Austria), Montane lakes, Ironus tenuicaudatus, Tobrilus grandipapillatus, Monhystera stagnalis. Ethmolaimus pratensis.

The Nematoda of the Vorderer Finstertalersee (Kuhtai, Austria) are presented. Five profiles were selected with main sampling stations about every five meters of depth. The benthic fauna is separated into three communities: the littoralslope-zone, where the nematode fauna is dominated by Ironus tenuicaudatus, the currentangle-zone, faunistically similar to the littoralslope-zone and the flat-depth-zone, the most im-portant zone for nematode fauna. Quantitatively important species are given. Nematodes live in mud zones rich in water, that is in the topmost 4 cm. Only Tobrilus grandipapillatus penetrates deeper, about 20 mm into the mud. Artificial weight classes and their relative frequency were chosen as the basis for determining the population dynamics. Details are given of Tobrilus cf. grandipapillatus, Monhystera ad stagnalis, Ethmolaimus pratensis, Ironus tenuicadatus, and Tripyla glomerans. The defined yield for the entire lake per year is 66 kg or about 4 kg per ha. Eighty percent of this amount is produced in the flatdepth-zone and 90% by T. grandipapillatus. Seven-ty-seven percent are produced from October to January, and only 8% between June and September. Reasons for the high production under the ice-cover are not entirely understood. (Jones-Wisconsin) W75-05746

PHYSICO-CHEMICAL REGIME AND BIOPRODUCTIVE PROCESSES IN

SEVAN (ARMENIA) IN TRANSITION FROM OLIGOTROPHY TO EUTROPHY, N. A. Legovich, A. G. Markosian, T. M. Meshkova, and A. I. Smolei.

Mitteilungen Internationalen Vereiningung Lim-nologie, Vol 18, Part 3, p 1835-1842, 1973. 3 fig. 6

Descriptors: *Water levels, *Physicochemical properties, *Productivity, *Eutrophication, Lake morphology, Depth, Benthos, Chara, Aquatic plants, Phytoplankton, Anabaena, Diatoms, Chlorophyta, Cyanophyta, Zooplankton, Behic fauna, Fish populations.

Identifiers: *Lake Sevan(Armenia), Alpine lake, Hygropanhytsterium; Fishurm, Polyarsthra vulcaries.

Hygroamblystegium irriguum, Polyarthra vulgaris, Arctodiaptomus acutilobatus.

The drain of Lake Sevan's (Armenia) waters over 30 years to meet the needs of the republic's economy has led to decrease of the lake level by 17 m and may be qualified as an experiment un-precedented in the history of limnology. Concurrent changes may be regarded as eutrophication caused by changes in its morphometry. During the summer the hypolimnion shows a progressively increasing oxygen deficit. The reduction of water transparency has nearly doubled. Concentration of the basic ions and the total amount of dissolved substances have undergone slight changes. With the decrease of the lake level the stony-pebbled bottom of the littoral zone has been replaced by sandy and sandy-oozy matter subjected to intensive wave action. Changes in the lake physiochemical conditions have been colsely as-sociated with simultaneous biological changes. The development Chara fragilis and Hygroamblystegium irriguum-the basic representatives of macrophyte in the open lake--has become slower. algal species have appeared among the phytoplankton of the pelagic zone. Polyarthra vulgaris and Arctodiaptomus acutilobatus have multiplied in zooplankton community. Lake Sevan, with its eutrophication closely related to the morphometric changes can be brought back to its previous state of oligotrophy by raising its water level by at least 7 m. (Jones-Wisconsin) W75-05747

ON THE DISTRIBUTION OF EURYTERMORA AFFINIS (POPPE) (COPEPODA) IN THE WESTERN SCHELDT ESTUARY,

N. de. Pauw. Mitteilungen Internationalen Vereiningung Lim-nologie, Vol 18, Part 3, p 1462-1472, 1973. 4 fig, 4 tab. 18 ref.

Descriptors: *Distribution, *Copepods. Descriptors: "Distribution, "Copepous, Estuaries, Salinity, Dominant organisms, Surface waters, Hypolimnion, Tidal effects, Mud flats, Salt marshes, Dispersion. Identifiers: "Eurytemora affinis, Western Scheldt Estuary(Netherlands).

Copepods were the main component of the zooplankton in the Western Scheldt Estuary, the Netherlands. Within this group, the holoplanktonic calanoid copepod species Eurytemora affinis occurred in the largest numbers and persisted throughout the year. The salinity-space distribu-tion of E. affinis in the estuary was analyzed and the ways in which the Eurytemora populations maintain themselves in certain areas studied. E. affinis appeared placebound, dependent on a direct import from quiet breeding-places in connection with the main stream as in the case of mud-flatsaltmarsh systems and on an indirect import as in the case of harbors and sluice-docks. This import explains the placebound presence in different geo graphically separated places along the axis of the estuary and its presence at different chlorinities, varying between sea and freshwater. The stream itself did not appear to have its own au-tochthonous population. The facts tend to prove that besides physical characteristics of the system, such as the estuarine circulation and the salinity distribution, the hydrogeographical detail struc

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ture of an estuary can be of major importance and can contribute to the maintenance and presence of a species. (Jones-Wisconsin) W75-05748

EUTROPHICATION, Yale Univ., New Haven, Conn. G. E. Hutchinson. American Scientist, Vol 61, No 3, p 269-279, 1973. 4 fig. 1 tab. 50 ref.

Descriptors: *Eutrophication, History, Colorimetry, Phytoplankton, Productivity, Nutrients, Carbon, Trace elements, Diatoms, Oligotrophy, Cyanophyta.

The meaning of the word eutrophication and its history are explained. Advances in methodlogy made possible the study of the nutrition and production of phytoplankton. Materials dissolved in lake water supporting phytoplankton have three ultimate geochemical sources; some come from the atmosphere (carbon dioxide, nitrogen), others from the ocean and carried in the atmosphere (sulfur, halogens), and some from the lithosphere (phosphorus, biological cations and trace metals). Regarding the elements obtained primarily from the lithosphere, phosphorus is most likely to be phosphorus and combined nitrogen, which usually increase during the winter months are depleted in the spring as the phytoplankton increases. Then the population of bloomforming algae begins to develop. Two lesser chemical aspects of the production of undesirable eutrophy are mentioned; one reason blue-green algae are so con-spicuous is because they tend to float at the surfaces of lakes and a second biological feature of blue-green algae is their inedibility by aquatic or-ganisms due to their shape, the gelatinous texture, and possibly to some chemical properties. The selective effect of zooplankton is probably of considerable significance. (Jones-Wisconsin) W75-05749

THE BIOLOGICAL IMPACT OF RESIDENTIAL REAL ESTATE DEVELOPMENTS IN THE SOUTH FLORIDA COASTAL WETLANDS. Bureau of Sport Fisheries and Wildlife, Atlanta, Ga.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-231 672, \$3.25 in paper copy; \$2.25 in microfiche.

Descriptors: *Environmental effects, *Land development, *Urbanization, Coasts, Wetlands, Dredging, Landfills, Canals, Land use, Drainage, Habitats, Water quality, Tidal effects, Legislation, Bulkheads, Riprap.

Identifiers: *Residential real estate, *South

The harshest human impact upon South Florida's coastal zone-and most particularly upon its marshes, beaches, and submerged bottoms-has been the wholesale conversion of coastal wetlands to residential real estate. The effects of dredging, filling, and canalizing in the coastal shallow waters and wetlands are summarized and analyzed. Continual dredging and filling is enormously destructive of estuarine biological values. Bottom organisms and vegetation in the offshore bottom area are obliterated by dredging. Recolonization of the bottom area by plants is usually prevented by excessive depths that prevent the penetration of sufficient sunlight for photosynthesis. Recent stringent regulation of submerged land dredging and filling has generated an increase in interior, so called upland canal construction. Whether of the bayfill or 'upland' type, canals and associated fills adversely affect fish and wildlife habitats by direct destruction of wetlands, degradation of water quality, and habitat oversimplification. Canal waterfront property construction radically alters or destroys many habitat niches-even before the predictable chain of events occurs that leads

directly to water pollution-before the first road is paved or residence erected. Recommendations are made for minimizing future adverse impact on wetlands by residential real estate developments. (Jones-Wisconsin) W75-05752

PLANKTON DEVELOPMENT DURING THE FIRST YEARS OF INUNDATION OF THE VAN BLOMMESTEIN (BROKOPONDO) RESERVOIR IN SURINAME, S. AMERICA, J. van der Heide.

Mitteilungen Internationalen Vereiningung Limnologie, Vol 18, Part 3, p 1784-1791, 1973.

Descriptors: *Plankton, *Reservoirs, *South America, Tropical regions, Water temperature, Dissolved oxygen, Thermal stratification. Identifiers: *Van Blommestein Reservoir, *Suriname River(South America).

Inundation of a large area of tropical rain forest and subsequent filling of the first reservoir for hydroelectric purposes in Suriname, South America was studied for 3-1/2 years. Observations on water temperature and dissolved oxygen and on plankton composition are discussed. In the shifting shore zone rapid oxygen consumption and considerable changes in plankton composition followed inundation of the forest floor. The development at a fixed station showed thermal stratification after the first period of disturbance. In the epilimnion, the oxygen content increased gradually. The plankton composition kept changing continuously in space and time. Certain organisms could be ranged in successional series, others showed periodicity phenomena in agreement with seasonal fluctuations of epilimnion temperatures and oxygen content. After stagnation crustaceans, rotifers, some flagellated green algae (Eudorina) and Euglenophyta increased notably in numbers. In the first months of inundation extensive algal mats (Spirogyra, Mougeotia) and fields of duckweed developed. From the beginning, the water hyacinth (Eichhornia crassipes) spread rapidly from a few colonies already present. Desmids dominated the plankton composition towards the end of the observation period. The epilimnion gradually increased in thickness. (Jones-Wisconsin)

VERTICAL PATTERNS OF PRIMARY PRODUCTIVITY IN CASTLE LAKE, CALIFOR-

C. R. Goldman, E. A. Stull, and E. de Amezaga. Mitteilungen Internationalen Vereiningung Limnologie, Vol 18, Part 3, p 1760-1767, 1973. 5 fig, 2 tab, 13 ref. NSF GB 6422X.

Descriptors: *Vertical migration, *Primary productivity, *Biorthyms, Lakes, Photosynthesis, California, Phytoplankton, Thermal stratification, Light penetration, Biomass, Water temperature, Light intensity, Biological communities, Depth, Diatoms, Chlorophyta, Cyanophyta, Ice cover. Identifiers: *Castle Lake(Calif).

Vertical distribution of peaks in phytoplankton productivity were examined in relation to thermal stratification, biomass distribution, and the distribution of species contributing the most to this biomass. For a single day the relative productivity of four species in relation to temperature, light, and the biological parameters of biomass and phytoplankton community productivity were considered. Primary productivity was measured in situ every 5 days at 11 depths with the C-14 method. Examination of the vertical distribution of productivity for the year, indicates that the highest productivity was very near the surface during the period of ice cover; as the ice melted the near surface maximum dropped to an intermediate depth above the thermocline and tended to fluctuate between 1 and 3 m. Diatoms were found throughout the water column with Tabellaria

fenestrata in dominance at 7 m, Chlorophycean Oocystis sp dominant at 10 m, and Cyanophycean Microcystis aeruginosa the most abundant species at 15 m. The nutrient response of the phytoplankton population need no longer be interpreted only in terms of change in biomass or community photosynthesis, but can now be traced to the species that do most of the actual work in lakes. (Jones-Wisconsin) W75-05755

THE AUTECOLOGY OF SAWGRASS (MARISCUS JAMAICENSIS) IN THE FLORIDA EVERGLADES,

Agricultural Research Service, Fort Lauderdale, Fla.

K. K. Steward, and W. H. Ornes. Available from the National Technical Information Service, Springfield, Va 22161 as PB-231 608, \$3.75 in paper copy; \$2.25 in microfiche. Ecological Report No DI-SFEP-74-04, May 1973. 10 p, 4

fig. 11 tab. 11 ref.

Descriptors: *Aquatic plants, *Florida, *Nutrient requirements, Standing crops, Density, Nutrients, Nitrogen, Phosphorus, Potassium, Copper, Marshes, Calcium, Iron, Zinc, Plant growth. Identifiers: *Sawgrass, *Everglades(Fla), Mariscus jamaicensis.

Investigation results are presented of characteristics of typical stands of sawgrass, Mariscus jamaicensis, in the Florida Everglades. Estimates were obtained of standing crop, plant density, stem length, leaf numbers, growth rate and nutrient relationships in tissue, soil and water, together with daily rainfall and water depths. Monthly estimates of these parameters were obtained over 12 to 18 months in mature stands and in stands regrowing after fires. The mature stands exhibited little seasonal variation within the parameters of standing crop, plant density or concentrations of most inorganic nutrients. Nutrient requirements were determined to be low, since tissue levels of nutrients were low particularly Cu and P, as compared to other species of Everglades macrophytes. Concentration of most nutrients in plants regrowing after fires was high during early growth stages, but decreased to levels found in older plants after 3 to 5 months with the exception of Ca, Fe and Zn. After 18 months' growth burned stands of sawgrass had produced only 38% of the standing crop contained in mature stands prior to burning. The apparent low nutrient requirements of sawgrass may partially explain its dominance in the marsh community. (Jones-Wisconsin) W75-05757

ECOLOGICAL AND PHYSIOLOGICAL CHARACTERISTICS OF THE MOST ABUNDANT SPECIES OF ZOOPLANKTON AND ZOOBENTHOS IN TWO NORTHERN LAKES, M. B. Ivanova, and A. P. Alimov.

Mitteilungen Internationalen Vereiningung Limnologie, Vol 18, Part 3, p 1479-1487, 1973. 2 fig, 6 tab, 5 ref.

Descriptors: *Animal physiology, *Zooplankton, *Benthic fauna, Lakes, Artic, Metabolism, Feeding rates, Growth rates, Energy transfer, Plankton, Crustaceans, Productivity, Biological communities, Cold regions, Larvae. Identifiers: Lake Krivoe(USSR), Lake Krugloe(USSR).

Investigations were carried out on two northern lakes, Krivoe and Krugloe, at the White Sea coast in Chupa Bay, USSR 30 km from the Polar Circle. Some ecological and physiological characteristics of the most abundant species of zooplankton and zoobenthos that are necessary for calculation of production of these lakes are metabolism rate food consumption, food assimilation and growth rate. The metabolism rate was calculated from the rate of animal respiration, which were maintained in closed bottles. Filtering rate of planktonic

crustaceans was determined by C-14 tracing method. Animals were maintained in submerged tanks in the lakes and their growth rate measured daily. Population/benthos in Lake Krivoe and Lake Krugloe is rather low compared with that in more southern lakes due to the lower water temperature in summer. The efficiency of utilization of assimilated food for growth decreases with the further complication of the structure of the organism--population--biocoenosis system. Planktonic crustaceans can be taken as an example. The ghest values of coefficients of biocoenosis were established for the individual growth, the lowest values for planktonic biocoenosis. (Jones-Wisconsin) W75-05759

THE ROLE OF MICROORGANISMS IN ECO-TOXICOLOGY, Institute for Water and Air Pollution Research,

Stockholm (Sweden). A. Jernelov

August 1974. 9 p. 4 fig.

Descriptors: *Microorganisms, *Toxicity, Metabolism, Metals, Bacteria, Fungi, Mercury, Translocation, Synthesis, Cobalt, Arsenic com-

pounds. Identifiers: Selenium, Tin, Palladium, Thallium, Plutonium, Methyl mercury, Methylation.

The effects of toxic chemical on microorganisms populations and the secondary effects of microbial population changes on other environmental factors that may affect man are discussed. The other type of interaction between microorganisms and c compounds is that where microorganisms affect the chemical compounds. Compounds serving as food are omitted. Metal and metalloid metabolism and especially cases where bacteria and fungi instead of degrading are synthesizing organometal compounds are considered. Conversion of divalent mercury to elementary mercury can be performed enzymatically by many microorgan-isms and is one way in which microbes detoxify mercury. The other detoxification mechanism through which microorganisms handle divalent mercury-biological formation of mono- or dimethyl mercury—has significance as it leads to accumulation of methyl mercury in fish and to a human health hazard when man consumes fish or other aquatic organisms from mercury con-taminated areas. The biological methylation of mercury can be predicted from its behavior and transport pattern in the environment. Biological methylation of selenium has been demonstrated. Tin, palladium and thallium can be methylated while lead, zinc, and cadmium cannot. Plutonium will be a greater problem in case breeder reactors into common use. (Jones-Wisconsin) w75-05760

NEARSHORE NEARSHORE ZOOFLANK 1912, SOUTHEASTERN LAKE MICHIGAN, 1972, Ann. Arbor. Great Lakes Michigan Un Research Div. Univ., Ann Arbor. Great

N. C. Roth, and J. A. Stewart.

Jr. Change and J. A. Stewart.

Jr. International Association of Great Lakes
Research, Proceedings 16th Conference Great
Lakes Research, p 132-142, 1973. 9 fig. 1 tab, 9 ref.

Descriptors: "Zooplankton, "Lake Michigan, "Biological communities, Varieties, Seasonal, Copepods, Crustaceans, Predation, Primary productivity, Shallow water, Deep water, Standing crop.

Results of collections made in the nearshore re-Results of collections made in the nearshore re-gion of southeastern Lake Michigan, near Bridgman, Michigan are presented. This was part of the preoperational study of a nuclear power plant site. These data are intended to reveal the seasonal succession of species on the eastern side of the lake and to characterize the difference between inshore and offshore zooplankton assem-blages. Three stations, ranging from inshore (1.2) km from shore, 14 m deep) to offshore (11.2 km from shore, 40 m deep), were sampled monthly April to November 1972. Total zooplankton populations ranged from less than 5000 individuals/cu m offshore in April to over 280,000 individuals/cu m inshore in August. In spring fauna was dominated by adult Cyclops bicuspidatus thomasi and adults of four Diaptomus species, with D. and adults of four Diaptomus species, with D. ashlandi most numerous, in summer by Bosmina longirostris and in fall by immature copepods and a diverse assemblage of Cladocera including Daphnia retrocurva, D. galeata mendotae, Eubosmina coregoni and Holopedium gibberum. A distinct inshore fauna with more Cladocera and fewer copepods than offshore occurred in summer. If may have been maintained by the property of summer. It may have been maintained by thermal stratification, fish predation or high inshore prima-ry productivity. (Jones-Wisconsin) W75-05761

DENITRIFICATION IN INDIANA LAKE, RESERVOIR, AND POND SEDIMENTS, Purdue Univ., Lafayette, Ind. For primary bibliographic entry see Field 5B. W75-05785

ENVIRONMENTAL FACTORS AFFECTING THE PROPERTIES AND PRECIPITATION OF COLORING COLLOIDS IN AQUATIC HABITATS, Louisiana State Univ., New Orleans. Dept. of

Biological Sciences.
For primary bibliographic entry see Field 5B.
W75-05787

THE RELEASE OF PHOSPHORUS FROM POND SEDIMENTS AND ITS AVAILABILITY TO LEMNA MINOR L., Rutgers - The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.

A. Fekete.

Available from the National Technical Information Service, Springfield, Va. 22161 as PB-240 486, \$4.75 in paper copy, \$2.25 in microfiche. Master's Thesis, October 2, 1973. 94 p. OWRT A-034-NJ(2). 14-31-001-3830.

Descriptors: Aquatic plants, *Bioassay, *Ponds, Bottom sediments, Aerobic conditions,
Phosphorus, Water pollution effects,
Eutrophication, Anaerobic conditions, *Pollutant
identification, *Analytical techniques.
Identifiers: Duckweed, *Lemna minor L.

Results are reported of a study of the availability of P released from pond sediments under aerobic and anaerobic conditions to Lemna minor L. A bioassay technique using Lemna to measure available P was developed and the results compared to chemical assays. A preliminary study showed that frond numbers, root length, frond diameter, and dry weight consistently reflected P concentrations in solution. Three sediments hav-ing low, medium and high NH4F+HCl-extractable P were incubated under aerobic and anaerobic conditions in minus P nutrient solutions. Lemna were then cultured in the decanted solutions. Greater release of available P took place under anaerobic conditions than under aerobic conditions. Extractable P values of the sediments corre lated well with bioassay growth responses. Levels of total P in the sediments and the chemically assayed P removed from the incubated solutions showed no relationship to the extractable P of the sediments or the bioassay responses of the Lemna.

These findings illustrate the superiority of the bioassay over chemical methods in the estimation of P availability to aquatic plants and the greater release of P from sediments under anaerobic conditions. (Riemer-Rutgers)

THE ECOLOGY OF THE PLANKTON OF THE CHESAPEAKE BAY ESTUARY, Johns Hopkins Univ., Baltimore, Md.

W. R. Taylor.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as COO 32796, \$9.50 paper copy, \$2.25 microfiche. Progress Re-port September 1972 - June 1973. 54 p, 1 fig, 6 tab, 8 ref. AEC AT(11-1)-3279.

Descriptors: *Chesapeake Bay, *Nutrients, *Estuaries, *Primary productivity, Nitrates, Nitrites, Ammonia, Color, Phosphorus, Carbon, Chlorophyll, Nitrogen, Phosphates, Carbon, Analytical techniques.

The major nutrient constituents in the Chesapeake Bay estuary were studied to establish a bay-wide baseline for chemical oceanography studies and to determine whether the major nutrients were at any time of the year possible limiting factors in primary productivity. Nitrate and nitrite analyses were made with a Technicon Autoanalyzer II system. Ammonium ion concentrations were determ The final color was measured on the Autoanalyzer using only the sampler pump, colorimeter with 630 nm filter and the recorder. Phosphorus analyses were run on the Autoanalyzer. Total dissolved carbon and inorganic carbon were determined with a Beckman Model 915 Carbon Analyzer. Dissolved organic carbon was taken as the difference between these quantities. Chlorophyll-a, chlorophyll-b, chlorophyll-c and phaeophytin analyses were done by the fluorometric method. In order to obtain both organic and total components, the ultraviolet irradiation method of Armstrong et al., was employed to oxidize aliquots of the samples. Preliminary results of nutrient analyses from Aesop Cruises are tabulated. Recoveries as nitrite plus nitrate of nitrogen after UV irradiation are given. Computation of typical correction factors for northern bay stations on Aesop 9 Cruise is shown. (Jones-Wisconsin) W75-05792

ON THE SPACE/TIME SCALE QUESTIONS IN LIMNOLOGICAL SYSTEMS ANALYSIS, Cleveland State Univ., Ohio.

F. M. Galloway.

Identifiers: *Space/time scale.

Water - 1973, American Institute of Chemical Enineers Symposium Series, Vol 70, No 136, p 40-49, 1974. 10 fig, 11 ref.

Descriptors: *Mathematical models, *Lakes, *Dimensions, Temporal Distribution, Spatial distribution, Pollutants, Algae, Great Lakes, Phosphorus, Mixing, Circulation, Eutrophication, Dispersion, Diffusivity, Physicochemical proper-

While the available computer capabilities place practical constraints on the choice of space/time scale, it is the space/time constants of the physi-cal-chemical phenomena involved that impose scale requirements for realistic answers to a given problem. This has seemingly been ignored in many limnological systems modeling efforts to date. Specific examples of space/time constants for physical-chemical phenomena basic to Great Lakes limnological modeling efforts are examined. The first example concerns the uptake of phosphorus by algae, an important reaction in eutrophication models. It is shown that large differences in predicted maximum concentrations of algae can occur depending on whether a two mile or ten mile space scale is used. This implication for

or ten mile space scale is used. Insimplication and eutrophication modeling is that important phenomena can be missed by choosing a space/time scale that is too large. The second set of examples concern lake circulation and mixing. It is implied that in many cases it may be complete. ly satisfactory to use the vertically integrated flow in a two-dimensional model to predict circulation and mixing, rather than using a three-dimensional model. Proper choice of space/time scale is essen-tial for efficient, accurate limnological systems models. (Jones-Wisconsin)

Group 5C-Effects Of Pollution

A MATHEMATICAL SIMULATION OF LAKE ECOLOGY AND CONTROL OF ITS BALANCE, University of Western Ontario, London. Faculty of Engineering Science

or Engineering Science.

J. T. T. Yang, and A. I. Johnson.

Water - 1973, American Institute of Chemical Engineers Symposium Series, Vol 70, No 136, p 66-82, 1974. 10 fig, 99 ref.

Descriptors: *Mathematical models, *Computer models, *Lakes, *Ecosystems, Biomass, Algal control, Zooplankton, Bacteria, Fish, Biochemical oxygen demand, Nutrients, Oxygen, Tempera-ture, Equations, Herbivores, Energy transfer. Identifiers: DYSYS computer program.

Up-to-date literature on the system approach to modeling aquatic ecosystems is surveyed and a model is developed for a lake ecosystem using Pontryagin's maximum principle for the control of lake ecosystems. The model includes a moderately large number of variables which are representative of the major biological, chemical, and physical or the major biological, chemical, and physical components of the lake. The interaction of various species is simulated using the flexible modular simulation program DYNSYS. A major advantage in using the DYNSYS approach is that it allows independently developed ecosystem modules to be dependently developed ecosystem includes to linked together into a larger system. Eventually a linked together into a larger system. manner. A feed-forward scheme is proposed for the control of the aquatic ecosystem from the disturbance caused by a BOD load applied to the lake from an inlet stream. Simulation results of this have been obtained. An optimal control problem for undersirable algae using aquatic her-bivores was formulated, and the optimal stocking and fishing rate was synthesized. The model developed is useful in describing some observed ecological phenomena and for estimating ecological changes due to pollution. Above all it is valuable for the development of strategies and means for controlling undesirable ecological changes. (Jones-Wisconsin) W75-05795

REMOVING IN EXCESS OF 99% PHOSPHORUS AT ELY, MINNESOTA, Graver Water Conditioning Co., Union, N.J.

R. L. Wilcox.

Water - 1973, American Institute of Chemical Engineers Symposium Series, Vol 70, No 136, p 358-366, 1974. 13 fig, 11 ref.

Descriptors: *Pollution abatement, *Eutrophication, *Nutrient removal, Waste water treatment, Tertiary treatment, Pilot plants, Sewage effluents, Phosphorus, Minnesota. Identifiers: "Shagawa Lake(Minn), Lake restoration, Demonstration project.

Shagawa Lake at Ely, Minnesota was chosen for a lake restoration demonstration because its location allows nutrient input to be reasonably well controlled, monitored, and results anticipated within a few years. An advanced wastewater treatment plant is now being constructed for addition to the existing conventional trickling filter plant. Primary objective of the plant is to achieve a residual of 0.05 mg/1 total phosphorus in all municipal wastewater discharge to Shagawa Lake and it is also designed to meet Minnesota effluent quality standards. This lake was also chosen for the experiment because it has a history of algal blooms, has received municipal wastewater effluent for nas received municipal wastewater effluent for many years, there is no significant agriculture and no industry except iron mining and logging, hence it was expected that municipal wastewater was the major nutrient source. The eutrophic state of the lake is uncommon in northeastern Minnesota and lake is uncommon in northeastern Minnesota and its water quality is particularly important because its outflow passes through parts of the Superior National Forest, Boundary Waters Canoe Area, and Canada. This project should demonstrate more conclusively than ever before, whether it is possible to reverse the eutrophication process by eliminating to greatest extent possible a major nutrient constituent. (Jones-Wisconsin)

W75-05796

ECOLOGICAL EFFECTS OF HEAT IN THE

RIVER, North Carolina Univ., Asheville.

J. Bernhardt.

Water - 1973, American Institute of Chemical Engineers Symposium Series, Vol 70, No 136, p 415-424, 1974, 7 fig. 7 ref.

Descriptors: *Balance of nature, *Heated water, *Effects, Ecotypes, Oxygen sag, Food chains, Water temperature, Fishkill, Growth rates, Dominant organisms, Fish, Herbivores, Aquiculture, Bass, Chara, Thermal pollution.

Identifiers: Tilapia mossambica, Lake Julian(NC), Synergistic interactions.

An aquatic system may be considered as a steady state system integrating physical, chemical and biological factors at the cell level, the organism, and the population. The major effects of heat are to make oxygen a limiting factor and to alter the steady state. To maintain full oxygenation it is important that nutrients be kept at low levels in heated waters. This should prevent blooms, which consequently should reduce oxygen stress, stabilize community structure, and lessen the dominance of blue-green algae. Biological viability and growth are affected by heat stress. Species diversity generally decreases with thermal stress. Food chains become simpler and populations are subject to more erratic fluctuations. Fish kills are conspicuous but effects of heated effluents are deceptive; they may result from any combination of stresses, i.e., the related problems of temperature and oxygen stress and species-specific pathogens. Synergistic interactions of stresses are important considerations in heated systems. For example, acceptable levels of substances such as copper sulfate become quite lethal as water temtures rise. Thermal gradients form barriers to peratures rise. I nermal graduals of the fish movement. Thermal beneficiation may be seen in improved growth rate of sport fish and the potential of aquiculture. (Jones-Wisconsin)

PRELIMINARY MODEL OF ESTUARY PHYTOPLANKTON, OF POTOMAC

Manhattan Coll., Bronx, N.Y. Environmental En-

Mannattan Coll., Bronx, N.Y. Environmental En-gineering and Science Program. R. V. Thomann, D. Di Toro, and D. J. O'Connor. Journal of the Environmental Engineering Div., American Society of Civil Engineers, Vol 100, No EE2, p 699-715, 1974. 9 fig, 2 tab, 8 ref.

*Mathematical models, Descriptors: *Phytoplankton, *Potomac River, *Estuaries, Chlorophyll, Water quality, Sewage effluents, Nutrient removal. Identifiers: Potomac Estuary, Waste load.

A preliminary model of the dynamic phytoplank-ton behavior in the Upper Potomac Estuary is presented. This research extends previous modeling efforts on the Potomac to incorporate explicitly space-time variability of chlorophyll-a as a water quality parameter, indicative of a eutrophied environment. This model is intended to shed further light on the water quality changes that can be expected when a waste reduction program is completed. A nonlinear dynamic model of phytoplankton chlorophyll verifies the observed phytoplankton chlorophyll verifies the observed 1968 and 1969 phytoplankton and nutrient tem-poral and spatial trends and approximately verifies the associated concentration levels. The data for 1968 were used to tune the model and the 1969 data were then used for independent verifications using coefficients from 1968 data and changing only flow, temperature, and incoming boundary conditions for the 1969 verification. Late fall phytoplankton blooms were not completely verified and a late winter bloom was not verified. Phytoplankton species discrimination is not incor-porated. Models of this type require additional evaluation and testing. Thus, further refinement of

the model is necessary before definitive state-ments can be made of the effects of nutrient reduction on phytoplankton chlorophyll in Upper Potomac Estuary. (Jones-Wisconsin)

EUTROPHICATION IN THE HIGH ARCTIC-MERETTA LAKE, CORNWALLIS ISLAND (75 DEGREE N LAT.), Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst. D. W. Schindler.

Journal Fisheries Research Board of Canada, Vol 31, No 5, p 647-662, 1974. 16 fig, 3 tab, 14 ref.

Descriptors: *Eutrophication, *Arctic, *Canada, Sewage effluents, Cold regions, Ice cover, Phytoplankton, Cycling nutrients, Standing crops, Oxygen sag, Physical properties, Self-purification, Sediments, Biological communities. Identifiers: *Meretta Lake(Cornwallis Island),

Char Lake(Canada).

Meretta Lake on Canada's Cornwallis Island, which has received sewage effluent from a trans-port base at Resolute Bay for over two decades, offered an ideal situation to evaluate eutrophica-tion in the high arctic. Minimum annual input of tion in the high arctic. Minimum annual input of phosphorus was 0.24-0.29 g/sq m of lake surface per year in 1971, with 66-80% supplied by sewage. Nitrogen input was 0.55-0.78 g/sq m during the same year, with 41 to 58% from sewage. Several explanations are suggested for the fact that a steady state has not developed. The significance of sediments in the annual chemical regime of Meretta Lake contrasts to nearby eligitotrophic Meretta Lake contrasts to nearby oligotrophic Char Lake. The sediments of both lakes have similar mineral composition, but Meretta sedi-ments contribute substantially to the chemical composition of the water of all elements except nitrogen, phosphorus, and sulfur, whereas in Char Lake only silica is supplied by the sediments to any significant degree. The sewage input to Meretta Lake is undoubtedly responsible for the difference. The fact that neither phosphorus nor nitrogen is returned from sediments in spite of high influxes of these elements and low oxygen concentrations, is of particular significance, in-dicating that the lake would quickly return to natural conditions once the sewage input ceased.
(Auen-Wisconsin) W75-05799

RECOMMENDATIONS OF THE GALVESTON BAY ENFORCEMENT CONFERENCE.

BAY ENFORCEMENT CONFERENCE.
Texas Water Quality Board, Austin; and Environmental Protection Agency, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-230 083, \$5.25 paper copy, \$2.25 microfiche. Progress Report, October 1972. 93 p, 7 fig, 7 tab.

Descriptors: *Bays, *Texas, *Regulation, *Pollution abatement, Estuaries, Commercial shellfish, Oil pollution, Dredging, Color, Biochemical oxygen demand, Water pollution, Pathogenic bacteria, Municipal wastes, Industrial wastes, Treatment facilities, Water pollution sources, Permits, Disinfiction.

Identifiers: *Galveston Bay(Texas), Houston Ship Channel(Texas), Regional waste treatment plants.

This conference was held to review the existing water quality situation of Galveston Bay and to lay a basis for future action. Among the recommendations included are that all wastes contributing bac-teriological pollution will be disinfected; the Texas Water Quality Board will continue its efforts to consolidate all small waste treatment plants. A study is being conducted on all sources of municipal and industrial wastes permitted by the Texas Water Quality Board to discharge effluent to Galveston Bay and its tributaries. These examinations shall emphasize determination of complex organic compounds, heavy metals and other potentially toxic substances, and oil and grease,

Waste Treatment Processes—Group 5D

from each waste source. Permits will be amended as necessary to insure that the best reasonable available treatment is provided relative to discharges of oil and grease. Greater reductions of waste will be required of waste dischargers. A characterization and evaluation of the water quality sigificance of materials contained in the organic sludge dredged from the Houston Ship Channel shall be conducted. Chemical constituents causing color, such as those from pulp and paper mills, shall be reduced. It is expected that the maximum waste load will be reduced to about 35,000 pounds per day of five-day BOD. (Jones-Wisconsin) W75-05801

THE FRESHWATER FISHES AND FISHERIES OF SOUTH FLORIDA,

Bureau of Sport Fisheries and Wildlife, Atlanta, Ga.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-231 631, \$3.75 paper copy, \$2.25 microfiche. Ecologi-cal Report No DI-SFEP-74-26, February 1974. 29 p, 9 tab, 11 ref.

Descriptors: *Freshwater fish, *Fisheries, *Florida, Canals, Marshes, Sunfishes, Eutrophication, Catfish, Sport fish, Commercial fish, Nutrient removal, Fish harvest, Varieties, Pounds of fish per acre, Water level fluctuations, Fish populations, Fish diets.
Identifiers: *South Florida, Everglades(Fla), Lake

Okeechobee(Fla), Big Cypress(Fla).

Native species of fishes of Florida and adjacent waters are listed by family and their common and scientific names. Accumulated data may be incorporated into a systems model for the purpose of better defining the relationships of fishes to each other, to their habitats, and to the other animal life forms, including man, in South Florida. All of the important freshwater sport fishes of South Florida belong to the family Centrarchidae, the sunfishes. The largemouth bass sport fishery of the Everglades is intimately associated with and vitally dependent upon the canals. Lake Okeechobee, a major regional and national sport fishery resource, has recently been evaluated as in an early eutrophic condition. It supports the only important freshwater commercial fishery in the South Florida Ecological Study area. Recommendations are the current legal restrictions on fish harvest from Lake Okeechobee be substantially relaxed, and that a renewed effort be undertaken to re-institute a commercial fishery for panfishes and other fishes, excepting largemouth black bass, having a market potential, as a method of nutrient removal. References of inventories, samples, and measurements of fish populations in south Florida are given. (Jones-Wisconsin) W75-05802

DIATOMS IN LAKES AND LAKE SEDIMENTS AS AN INDEX TO ENVIRONMENT. PART 1. DIATOM STRATIGRAPHY AND HUMAN SET-TLEMENT IN MINNESOTA. Minnesota Univ., Minneapolis.

J. P. Bradbury.

Available from the National Technical Informarayanaure from the National Technical Informa-tion Service, Springfield, Va. 22161, as COO 20461, \$6.75 paper copy, \$2.25 microfiche. Final Report, May 1969-April 1972. 89 p, 17 fig, 2 tab, 52 ref. AEC AT(11-1)-2046.

Descriptors: *Geologic history, *Diatoms, *Sediments, *Stratigraphy, Minnesota, South Dakota, Cores, Human population, Eutrophication, Palynology, Paleolimnology.
Identifiers: *Cultural impact, Lake(Minn), Elk Lake(Minn), Pickerel Lake(SD), Detroit Lakes Area(Minn), Lake Sallie(Minn), St. Clair Lake(Minn), Lake Minnetonka(Minn), Tanager Lake(Minn).

The principal factors that make diatoms important microfossils for studying the history of aquatic environments are their abundance, ecologic diversi-ty, preservation, identification, and quantification. Fossil diatom assemblages in short cores of lake sediment from nine environments in seven lakes in Minnesota and South Dakota show the reaction of diatoms to limnologic changes associated with lacustrine enrichment following Euro-American settlement. The time of settlement is stratigraphically determined by a rise in the proportion of Am-brosia pollen and by other sediment characteristics. Changes in diatom stratigraphy are interpreted in the context of local settlement history and its probable limnologic effect. The common diatoms occurring in Minnesota lake deposits can be grouped broadly into two major habitat types: planktonic and benthic. As lakes become increasingly enriched with nutrients, the summer diatom plankton is replaced by blue-green algae, which leave no fossil record. The stratigraphic record is dominated instead by late winter and spring diatoms, which prosper in eutrophic water. There are several variations on this theme, Depending on the initial trophic state and other limnologic characteristics, but overall, the diatom stratig-raphy of a lake is an effective way to measure the cultural impact on the lake ecosystem. (Jones-Wisconsin) W75-05805

HOW TO READ A FISH KILL,

Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 5A. W75-05812

5D. Waste Treatment Processes

LIVESTOCK MANURE DISPOSAL VIA HYDROGASIFICATION, Kansas Water Resources Research Inst., Manhat-

H. F. Rosson.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 960, \$5.75 in paper copy, \$2.25 in microfiche. KWRRI Contribution No. 155, December 1974. 126 p, 24 fig, 36 tab, 33 ref, 4 append. OWRT A-051-KAN(1). 14-31-0001-3516.

Descriptors: *Feed lots, Water pollution, *Farm wastes, *Waste disposal, Gases, Livestock, *Waste water treatment, Energy, Organic com-

pounds. Identifiers: *Hydrogasification, Hydrogasification yields, Optimum water content, Molten salt, Manure disposal, Supplemental energy, Low sulfur gases, Hydrocarbon gases, Batch reactions.

Manure could be an important source of car-bonaceous material and its hydrogasification could help solve the water pollution potential of feedlots as well as provide a supplemental energy resource. Manure can be hydrogasified to produce a mixture of low sulfur gases containing principally water, hydrogen, methane, ethane, and carbon dioxide. The yield of hydrocarbon gases in batch reactions is dependent on the reaction temperature and the hydrogen feed to carbon ratio with higher values producing higher yields. The presence of water is beneficial to yield with an optimum initial water content in the manure of about 50%. When using a molten carbonate salt reaction medium, the op-timum initial water content may be slightly smaller. The hydrogasification thermic yield is defined to be the heating value of the dry product gases minus the heating value of the hydrogen feed per unit mass of manure. At a reaction temperature of 1050 degrees F, a maximum thermic yield of 3700 Btu/lb dry manure occurs at a hydrogen feed to carbon ratio of about 0.25 moles/mole. Use of a salt medium increases hydrocarbon yield slightly and increases thermic yield to a maximum of about 5500 Btu/lb dry manure at a hydrogen feed to carbon ratio of .93 moles/mole.

W75-05351

FEASIBILITY STUDIES OF THE PARTITION-ING OF COMMERCIAL HIGH-LEVEL WASTES GENERATED IN SPENT NUCLEAR FUEL REPROCESSING: ANNUAL PROGRESS RE-PORT FOR FY-1974,

Oak Ridge National Lab., Tenn. W. O. Bond, and R. E. Leuze.

Available from the National Technical Information Service, Springfield, Va. 22161, as REPT. No. ORNL-5012, \$5.45 in paper copy, \$2.25 in microfiche. Report ORNL-5012, January 1975. 108 p, 15 fig, 15 tab,371 ref.

Descriptors: *Feasibility studies, *Radioactive waste, *Research and development, *Waste treatment, *Separation techniques, *Solvent extraction, Ion exchange, Neptunium, Uranium, Plutoni-um, Americium, Curium, Fuels, Nuclear power-

Identifiers: Fuel reprocessing, *Actinides.

Feasibility studies for removing long-lived actinides from high-level waste have been evaluated on a preliminary basis. Results indicate that it may be possible to remove actinides to a sufficiently low level to decrease the potential hazard of highlevel waste at 1000 years to a value comparable to that of naturally occrring uranium minerals. The feasibility study was directed primarily at highlevel waste generated by the commercial reprocessing of light-water reactor fuel. A research and development program is required to determine whether these separations processes can be modified successfully and adapted to achieve the necessary separations and, in turn, be integrated into a functional waste processing facility at the expected levels of radioactivity. Data obtained thus far indicate that the most promising concept for achieving the desired removals of actinides will require improved recovery of actinides in conventional reprocessing of fuels as well as secondary processing of the waste. Present laboratory studies are designed to pin-point the advantages of promising potential processes and to resolve some of the difficult chemical problems. (Houser-ORNL) W75-05368

FEASIBILITY STUDIES FOR DECONTAMINA-TION AND DENSIFICATION OF CHOP-LEACH CLADDING RESIDUES, Battelle-Pacific Northwest Labs., Richland.

Wash.

Available from NTIS, Springfield, Va. as REPT. No. BNWL-1820, \$5.45 in paper copy, \$2.25 in microfiche. Report BNWL-1820, July 1974. 54 p, 1 fig, 11 tab, 83 ref.

Descriptors: *Radioactive wastes, Liquids, *Nuclear wastes, *Waste treatment, *Waste disposal, Research and development, Streamflow, Gases, Aqueous solutions, Metals, Separation techniques, Density, Uranium, *Feasibility stu-

Identifiers: *Decontamination

The properties of the chop-leach cladding hull waste stream are reviewed with respect to aqueous, molten salt, and molten metal decontamination. The removal of transuranic contamination and densification of the waste stream by melting appear feasible but technically difficult to produce an acceptable product with only a small increase in the mass of the total waste stream. Research is indicated to develop a process utilizing a gaseous film alteration, aqueous film removal and etching, and flux extraction of the molten metal. (Houser-W75-05371

Group 5D—Waste Treatment Processes

CHEMICAL ENGINEERING DIVISION, WASTE MANAGEMENT PROGRAMS, QUARTERLY REPORT, APRIL-JUNE 1974,

Argonne National Lab., Ill. M. J. Steindler, N. M. Levitz, W. J. Seefeldt, and

L. E. Trevorrow.

L. E. Trevorrow. Available from NTIS, Springfield, Va. as REPT. No. ANL-8134, \$5.45 in paper copy, \$2.25 in microfiche. Report ANL-8134, November 1974. 50 p, 11 fig, 5 tab, 80 ref.

Descriptors: "Radioactive waste disposal, "Soilds, "Underground waste disposal, "Underground storage, "Retention, Safety, Stability, Storage tanks, Specific retention, Evaluation, Research and development, Degradation, Metals. Identifiers: Decontamination.

Effort on several diverse areas of work related to the study of consolidation techniques for fuel-cladding hulls is reported, along with an outline of the program for FY-1975. The emphasis of work was shifted largely to reviewing information on processes that have applicability to the decon-tamination of hulls, and finding sources of and negotiating for a supply of irradiated Zircaloy for the upcoming experimental program. A brief review is presented of the program for FY-1974 on the salvage of alpha-contaminated metals. An assavage or appa-contaminated metals. An as-sessment of pertinent information indicates that a pyrochemical concept appears to be the most suitable approach to solving the problem of decon-tamination and salvage of alpha-contaminated metals. (Houser-ORNL) W75-05383

FEASIBILITY AND ALTERNATE PROCEDURES FOR DECONTAMINATION AND POST TREATMENT MANAGEMENT OF PU-CONTAMINATED AREAS IN NEVADA, California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology. For primary bibliographic entry see Field 5G. W75-05384

REVIEW OF THE ENGINEERING ASPECTS OF POWER PLANT DISCHARGES, Hydronautics, Inc., Laurel, Md. For primary bibliographic entry see Field 5B. W75-05386

REDUCTION OF ATMOSPHERIC POLLUTION BY THE APPLICATION OF FLUIDIZED-BED COMBUSTION: ANNUAL REPORT, JULY, 1972-JUNE, 1973,

Argonne National Lab., Ill. G. J. Vogel, M. Haas, W. Swift, J. Riha, and C. B.

Available from the National Technical Informa-tion Service, Springfield, Va., 22161, as Rept. No. ANL/ES-CEN-1006 and EPA-650/2-74-057, 55.45 in paper copy, \$2.25 in microfiche. Report ANL/ES-CEN-1006 and EPA-650/2-74-057, June 1973. 131 p, 31 fig, 27 tab, 6 ref.

Descriptors: *Air pollution, *Waste treatment, *Waste disposal, *Gases, *Trace elements, Burning, Chemical reactions, Oxidation, Fuels, Coals, Sulfur compounds, Powerplants. Identifiers: *Combustion, *Fluidized-bed.

The program for demonstrating the feasibility of fluidized-bed combustion for possible use in power and steam plant applications is divided into three studies: (a) combustion of fossil fuels in a pressurized combustor, (b) regeneration of sulfated additive for reuse in the combustor, and (c) evaluation of the type and level of trace-eletelephanian control of the type and revel of trace-eigenent pollutants in the flue gas. A fluidized-bed combustion pilot plant and a fluidized-bed regenerator, both capable of operating at 10-atm pressure, have been tested and operated. In combustion of coal at 9-atm pressure and 1550 degrees F (843 degrees C), high (greater than 90%) retention of sulfur in the fluidized bed of dolomite has been obtained with continuous addition of fresh dolomite at a Ca/S ratio of 3. The NO level in the flue gas has been low, less than 150 ppm. Two favored methods for regenerating the sulfated dolomite have been studied: a one-step reductive decomposition of the CaSO4 to CaO at about 1950 degrees F to release SO2, and a two-step process consisting of reducting of CaSO4 to CaS at about 1700 degrees F followed by reaction of CaS with 1700 CO2 to release H2S. Complete release of sulfur from the particles has not been achieved by either regeneration method, and decreption of the particles has been observed. Equipment has been constructed and analytical methods have been selected for determining the quantity and concentration of trace element pollutants in solid or gaseous form in the flue gas. (Houser-ORNL) W75-0392

QUARTERLY PROGRESS REPORT: RESEARCH AND DEVELOPMENT ACTIVITIES, WASTE FIXATION PROGRAM, APRIL THROUGH JUNE 1974,

THROUGH JUNE 1974, Battelle-Pacific Northwest Labs., Richland, Wash. Nuclear Waste Technology Dept. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as Rept. No BNWL-1841, \$5.45 paper copy, \$2.25 microfiche. Report BNWL-1841, July 1974. 89 p, 36 fig, 13 tab.

Descriptors: *Management, *Radioactive waste disposal, *Waste water treatment, *Solids, *Liquids, Evaporation, Waste storage, Alternative planning, Safety, Evaluation, Research and development. Identifiers: *Waste fixation, Product characteriza-

Progress is reported for the research and development activities of the waste fixation program. Efforts in commercial waste fixation, product characterization, alternative waste fixation schemes, and safety and systems evaluation are summarized. (Houser-ORNL) W75-05393

TELEMETRY IN WATER POLLUTION CON-TROL, South Yorkshire Metropolitan Country Council

(England). J. R. Holmes

Water Pollution Control, Vol 73, No 4, p 433-442, 1974. 11 fig.

Descriptors: *Telemetry, *Water pollution control, Sewage treatment, Computers, Automation, Equipment, Monitoring, *Waste water treatment.

Telemetry and data transmission are applicable to water and sewage treatment. The use of so-phisticated computer equipment is described, both analysis and treatment are made by remote control. A total feedback loop is not presently possi-ble, one by which equipment would monitor the in-coming effluent, select the appropriate treatment, and direct the sewage treatment machinery with outfall instrumentation. Parts of this system, however, are feasible. Described are multiplexing, transmission media, autodialling monitoring systems, the operational outstation, and the opera-tional master station. (Prague-FIRL) W75-05397

DESCRIPTION OF A NEW WASTE WATER ANALYZER FOR LABORATORIES (RESPIROMETER) (IN HUNGARIAN), For primary bibliographic entry see Field 5A. W75-05398

THE RECLAMATION OF WATER FROM SEWAGE EFFLUENTS BY REVERSE OSMO-SIS, Pollution Research Lab., Stevenage

(England). D. A. Bailey, K. Jones, and C. Mitchell.

Water Pollution Control, Vol 73, No 4, p 353-366, 1974. 8 fig, 3 tab, 40 ref.

Descriptors: *Water supply, *Reverse osmosis, Effluents, *Sewage treatment, *Water reuse, Reclamation, Costs, *Waste water treatment, Treatment facilities. Identifiers: United Kingdom.

A major water supply source in the United King-dom is river water; the problem of reclamation of this source of water from effluents for direct reuse is discussed. Several techniques have been considered for reclaiming water from secondary sewage effluents. These include treatment with activated carbon, chemical treatment, treatment with ozone, ion exchange, and thermal and mem-brane processes. The process of reverse osmosis is described in detail. A reverse-osmosis system gives adequate mechanical support to a membrane while providing suitable hydrodynamic conditions for the process water to reach and be removed from the membrane surface. The process removes from the membrane surface. The process removes organic and inorganic substances present in solution. The efficiency of removal of each species depends on ionic charge, molecular weight, and chemical properties. Bacteria and viruses can be removed from solution by this treatment method. In economic terms, the performance and useful life of membranes critically affects the costs of a reverse composis plant. The maximum flux which reverse-osmosis plant. The maximum flux which can now be economically maintained is of the being conducted on developing membranes with increased permeability without loss of desalinating properties. (Prague-FIRL) W75-05399 order of 0.5 cu m/d. Further study, however, is

REMOVAL OF HEAVY METAL CONTAMI-NANTS FROM FLUID STREAMS, Atomic Energy Commission, Washington, D.C. E. L. Albenesius, E. R. Russell, D. W. Tharin, and A. R. McJunkin.

A. R. McJunkin.
Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as PAT APPL-414 029, \$4.00 in paper copy, \$2.25 in microfiche. Patent Application Number 414, 029, November, 1973. p 18, 5 fig.

Descriptors: *Heavy metals, *Industrial wastes, *Waste water treatment, *Mercury, *Water pollu-tion, Sulfur, Sorption, Rubber, Arsenic com-pounds, Lead, Copper, Gold.

A fluid containing heavy metal contamination is decontaminated by intimately contacting the fluid with a sulfur bearing shredded rubber material. The method is particularly applicable in removing mercury from aqueous industrial waste solutions. Other contaminating metals that may at least be partially removed from solution include arsenic, lead, copper, silver, gold and platinum. Contact between the solution and rubber can be made in a continuous or a batch type process as well as in a continuous or a batch type process as well as in a series of batch type stages. Continuous flow through a column containing shredded rubber materials acts to filter out undissolved particles as well as to sorb dissolved metal from the solution. Shredded rubber can also be distributed into seepage or retention ponds to at least partially purify the waste liquid. (Pulliam-Vanderbilt) W75-05412

DAVIS COUNTY COMPREHENSIVE STUDY: CULINARY WATER, PRESSURE IRRIGATION WATER, SANITARY SEWERAGE. Davis County Planning Commission, Farmington, Utah.

For primary bibliographic entry see Field 3F. W75-05418

SEWAGE TREATMENT DIVISION REPORT, 1970-1971-1972, CITY OF EUGENE (OREGON). Eugene Dept. of Public Works, Oreg. Sewage Treatment Div. 1973, p 28, 5 fig, 12 tab.

Descriptors: *Waste water treatment, *Sewage Descriptors: "waste water treatment, "Sewage treatment, "Municipal wastes, "Operation and maintenance, "Treatment facilities, "Trickling filters, Oregon, Sewage, Operating costs, Public utilities, Sewage sludge disposal, Sewage sludge disposal, Sewage sludge disposal, Sewage systems, Sewerage, Sewers. Identifiers: "Eugene(Oregon).

Operational data, problems and needs for the Eugene, Oregon Water Pollution Control Plant are summarized. The treatment plant operates as a trickling filter. Incoming raw wastewater is (1) screened or comminuted, (2) passed through a primary clarifier for sedimentation, (3) treated biologically by the trickling filters, (4) passed through a secondary clarifier and (5) discharged into the Willamette River. A portion of the wastewater is recycled through the trickling filters. Operational problems and facility deficiencies are described and recommendations are given for conidentified and recommendations are given for cor-rection. The 1970 additions more than came up to expectations on improving plant performance. The plant did meet all state requirements during 1972. However, the continually increasing load will soon produce a shortage of plant capacity. Immediate consideration should be made to plan for more capacity since there is a three year lag from start of planning to use of the facilities constructed. The separation of storm from sanitary sewer program, separation of storm from sanitary sewer program, plus the increased treatment capacity resulting from the 1970 primary clarifier addition, has for all practical purposes, eliminated any by-passing of raw sewage during the rainy season. Flows up to 45 MGD receive primary and secondary treatment. (Poertner) W75-05429

COMPREHENSIVE WATER AND SEWER PLAN, BRADLEY COUNTY, TENNESSEE. Sanders (B.G.) and Associates, Inc., Atlanta, Ga. For primary bibliographic entry see Field 6B.

THE ENVIRONMENTAL FLOW OF CADMIUM AND OTHER TRACE METALS: VOLUME I, Purdue Univ., Lafayette, Ind. For primary bibliographic entry see Field 5B.

ELECTROCHEMICAL REMOVAL OF HEAVY METALS FROM ACID MINE DRAINAGE, Ecotrol, Inc., Columbia, Md.

N. B. Franco, and R. A. Balaouskus. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-232 764, 54.75 in paper copy, \$2.25 in microfiche. EPA Report No 670/2-74-023, National Environmental Research Center, Cincinnati, Ohio, May, 1974, 95 p, 24 fig, 19 tab, 31 ref.

Descriptors: *Electrochemistry, *Acid mine water, *Heavy metals, *Waste water treatment, Economics, Electrolysis, Waste water, Acid streams, Mine drainage, Hydrogen ion concentration, Electrodes, Economic efficiency, Water pollution, *Costs, Mine drainage.

Laboratory and field studies were conducted to determine the economics of ferrous iron oxidation in a cell containing a bed of conductive particles in the space between the cathode and the anode. The the space between the cathode and the anode. I ne effects of the process on other heavy metals present in acid mine drainage (AMD) and on the character of solids precipitated during treatment of low acidity water were also observed. An 18.9 liter/min (5 gal./min) pilot plant was operated at an actual mine site to evaluate treatment of 40 and 50 acid for the control of the contro 250 ppm ferrous iron AMD at pH levels of 2 and 5. A conventional aeration system was also included to generate comparative data. Approximately 86 percent of the ferrous iron was oxidized during electrolysis of the low pH water. The conversion rate was less in the pH 5 AMD due to coating of electrode sites with ferric hydroxide. A 4 to 10% decrease from 4 ppm occurred in manganese concentration, while alluminum feed values of approximately 1 ppm were reduced by 40 to 60% especially in the pH 2 water. Estimates for a 473 litter/min (125 gal./min) plant based on the pilot data for oxidation only indicate that capital and operating costs for electrochemical treatment would be higher than those for aeration by factors of 5 and 1.7 respectively. (Pulliam-Vanderbilt) W75-05433

CONTROL OF MERCURY IN EFFLUENTS FROM CHLORINE PLANTS,
Swedish Water and Air Pollution Research Lab.,

H. O. Bouveng. Pure and Applied Chemistry, Vol 29, Nos 1-3, p 75-91, 1972. 5 fig, 3 tab, 11 ref.

Descriptors: *Mercury, *Water pollution control, *Pollution abatement, *Heavy metals, *Industrial wastes, Chlorine, Environmental effects, Water pollution sources, Water pollution, Toxicity, *Waste water treatment, *Separation techniques.

Background information as to the environm effect of discharges of mercury is provided. The information has justified a programme, outlined in the paper, for reducing mercury in products, waste waters and vented air from chlorine plants using the mercury process. The strict separation of the waste waters and certain technical measures creates possibilities of reducing the discharges effectively. An 80 per cent reduction of the mercury in effluents was achieved, for example, by sub-stituting indirect forced cooling of the hydrogen for the traditional direct cooling and returning the condensate to the head of the amalgam decomposers. The major cause of discharge of mercury posers. The major cause of discharge of merculy with vented air was found to be leaking hot hydrogen in the cell room. Different principles for the polishing of the final effluent and for the removal of mercury from the caustic soda produced are described. (Jernigan-Vanderbilt) 1975.05436.

ANIMAL WASTE CONVERSION SYSTEMS BASED ON THERMAL DISCHARGE,

Oregon State Univ., Corvallis. Dept. of Soil

L. Boersma, E. W. R. Barlow, J. R. Miner, and H.

A. ranney. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 113, \$4.25 in paper copy, \$2.25 in microfiche. Special Report 416, Agricultural Experiment Station, Sep-tember 1974. 51 p, 12 fig, 11 tab, 96 ref. OWRT B-039-ORE(1). 14-31-0001-4121.

Descriptors: Biodegradation, Anaerobic digestion, *Energy conversion, *Waste treatment, *Recycling, Farm wastes, Production, Microorganisms, Nutrients, Protein, Gases, Methane, Thermal pollution, *Beneficial use, Conservation. Identifiers: *Waste heat utilization, Thermal

Society faces many problems related to its growth in numbers and standard of living. Of major con-cern is environmental degradation resulting from ollution and the consumptive use of non-renewable natural resources. An animal waste management scheme was developed on the premise that one solution to these problems is the development of integrated production systems with recycled sources. The waste product of one industry must become the raw material for another. The feasibility of using waste heat from steam electric plants to sustain a food-producing complex which recycles nutrients is analyzed. Specifically, it is proposed to use microorganisms to convert animal waste into a high protein animal feed and a methane-rich fuel gas. Waste heat from steam electric plants is used as a low cost source of energy for maintaining stable, elevated temperatures in anaerobic digestion and single cell protein production units. Benefits to society include: improved efficiency of energy use and food production, recycling of raw materials, and conservation of non-renewable

NEUTRALIZATION OF ACIDIC WASTES BY CRUSHED LIMESTONE: EVALUATION OF PROTOTYPE CRUSHED LIMESTONE BAR-RIERS FOR THE NEUTRALIZATION OF ACIDIC STREAMS,

Pennsylvania State Univ., University Park. Dept. of Civil Engineering. For primary bibliographic entry see Field 5G.

W75-05454

COMPARISON OF SEPTIC TANK AND AERO-BIC TREATMENT UNITS: THE IMPACT OF WASTEWATER VARIATIONS ON THESE SYSTEMS

Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering. E. R. Bennett, K. D. Linstedt, and J. Felton.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 186, \$3.75 in paper copy; \$2.25 in microfiche. Presented at the Rural Environmental Engineering Conference, Warren, Vermont, September 26, 1973. 27 p, 9 fig, 4 tab, 14 ref. OWRT A-021-COLO(3).

Descriptors: *Waste water treatment, *Septic *Aerobic treatment, Water utilization, tanks. Domestic wastes, Leaching, Evapotranspiration, Economic efficiency.
Identifiers: Household waste water.

Nearly one-third of the homes in the United States are located in unsewered areas and must rely on some form of individual treatment and disposal system for dealing with household wastewater.
Water use patterns for individual homes were recorded by function including sinks, shower bath, dishwasher, washing machine, garbage disposal and toilets. Flow characteristics were determined by use of a water use chart recorder. Pollution strength characteristics of each of the wastewater discharges are also presented. These include BOD, COD, SS, MBAS, PO4, and temperature. Individual home wastewater treatment alternatives of septic tank with leaching field, septic tank with evapotranspiration bed and aerobic systems are evaluated on a cost and efficiency standpoint. W75-05459

ADSORPTION OF PHOSPHORUS BY UNSATU-RATED SYNTHETIC SOIL. Purdue Univ., Lafayette, Ind. Dept. of Agricul-

tural Engineering.
For primary bibliographic entry see Field 5B. W75-05463

AN EVALUATION OF WATER REUSE FOR

MUNICIPAL SUPPLY, Southern Illinois Univ., Carbondale. IWR Contract Report 74-11, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., December 1974. p 266, 31 fig, 33 tab, 70 ref, 6 ap-

*Evaluatin. *Water Descriptors: *Municipal water, *Water supply, *Economic efficiency, *Simulation analysis, *Alternative planning, *Waste water(Pollution), Water demand, Recycling, Water quality, Decision making, Attitudes, Psychological aspects, Public health, Safe yield, Droughts, Assessment, Streamflow,

Mathematical models, Systems analysis, Computer programs, *Colorado.
Identifiers: *Water renovation, Colorado Springs(Col), Consulting engineers, Population projections, Cost minimization.

Reuse can be an alternative source of water for municipal water supply systems. The demand for water continues to increase in the United States,

Group 5D—Waste Treatment Processes

especially in the burgeoning urban areas; the tradial alternaives for water supply planning, while useful in the past, are either inappropriate today or may no longer be practicable. Recycling renovated waste water has been shown, under specific qualifications, to be a socially acceptable and economically efficient alternative for municipal water supply planning. Two problems may be re-lated to the low community adoption of water reuse: the unavailability of a methodology to access the relative value of reuse and the professional biases of consulting engineers and public health officials. A review is presented of the alternatives for balancing supply of and demand for municipal water. A simulation model for evaluating the economic efficiency of water reuse is formulated and applied to a single community in Colorado, and the nature and role of professional bias in the decision making process in water resue planning are described. The simulation model is designed to investigate the reuse of municipal sewerage as a supplement to present sources of water supply. The model is used to compare alternative plans that include minicipal reuse over fifty year period. The objective is to provide water at um cost for the duration of the projection period. Costs considered include capital, opera-tion, and maintenance for both water supply and waste treatment. All costs are incremental, except those associated with present installations. (Bell-Cornell) W75-05482

EVALUATION OF QUALITY PARAMETERS IN WATER RESOURCE PLANNING (A STATE-OF-THE-ART SURVEY OF THE ECONOMICS OF WATER QUALITY),

For primary bibliographic entry see Field 5G. W75-05483

MEASURES TAKEN AGAINST WATER POL-LUTION IN BASIC NON-FERROUS METAL IN-

Pure and Applied Chemistry, Vol 29, Nos 1-3, p 235-261, 1972, 16 fig, 4 tab, 28 ref.

Descriptors: *Const4aints, *Water pollution, *Europe, Air ponument, Ion exchanger, Heavy metals, *Europe, Air pollution, Technological advancement, Ion exchanger, Recirculation, Water purification, Recycling, Reclamation, Electrolysis, Scrubbers, Leaching, Washing, Cleansing, *Waste water treatment. Identifiers: Hydrometallurgy.

The unit operations of hydrometallurgy technilogically parallel the methods of effluent treatment in the non-ferrous metal industries. Examples were given which show recent developments and ways of relieving lower degrees of waste water pollu-tion: (1) Increase in the use of salt solutions for producing magnesium: (2) Measures for the prevention of air pollution during aluminum elec-trolyses cause new effluent problems to arise; (3) Wet or dry gas cleaning in the case of salt cover furnaces at aluminum remelting plants; (4) Change in a process for copper cementation - copper (I) chloride as an intermediate product of recovery: (5) Ion exchangers as concentration steps for purifying waste water containing non-fer-rous metals; (6) Waste water purification at an ISP plant; (7) Utilization of leaching residues from zinc electrolysis plants; (8) Use of waste lime for hydrometallu irgical processes; (9) Recovery special metals by means of ion exchangers; (10) Recovery of service water as a valuable product in the purification of waste water in basic non-ferrous metal industries. It was noted that some unsolved problems need better technical processes to reduce unfavorable biological effects produced by low concentrations of metal salts, and that future developments in non-ferrous metal works have to examine the water economy conditions closely to meet requirements for a higher metal yield and a better water purification. (Rowe-Vanderbilt) W75-05484 AEROBIC BIOSTABILIZATION OF SANITARY LANDFILL LEACHATE

Crawford, Murphy and Tilly, Inc., Springfield, Ill. E. N. Cook, and E. G. Foree.

J Water Pollut Control Fed. Vol 46, No 2, p 380-

Identifiers: Aerobic conditions, *Biological treat-ment, *Landfills, *Leachate, Pollution, Sanitary conditions, Stabilization, *Waste water treatment.

Aerobic biological treatment was effective for sta-bilizing sanitary landfill leachate in a series of laboratory experiments. The best operational conditions were for a detention time of 10 days, which gave mixed liquor volatile suspended solids congave mixed inquor volatile suspended about centrations of 4000 mg/l or more in the completely mixed, no-recycle systems. Stabilization of chemical oxygen demand was greater than 97% and biochemical oxygen demand was reduced by more than 99%. Mixed liquor settling properties were good, nutrients were removed, and odor was completely removed. Units with detention times of d 5 days failed. Activated carbon was useful or effluent polishing. Physical-chemical treatment of raw leachate was only partially successful.— Copyright 1974, Biological Abstracts, Inc. W75-05507

AQUIFER CLOGGING IN COMBINED WASTE-

WATER RECHARGE,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.

S. A. Jubboori, G. L. Stewart, and D. D. Adrian Journal Water Pollution Control Federation, Vol 46, No 12, p 2732-2744, December 1974. 9 fig, 4 tab, 22 ref. OWRT A-045-MASS (1) and B-011-MASS (14).

Descriptors: *Underground storage, *Aquifers, *Clogging, *Recharge wells, *Model studies, Waste water disposal, Waste water treatment, Water reuse, Permeability, Steady flow, Dupuit-Forchheimer theory, Potentiometric level. Forchheimer theory, Potentiometric level, Chlorination, Microbial degradation, Simulation

dentifiers: *Combined wastewater, nodels, Chemical treatment, Backwashing. Identifiers:

A laboratory model was constructed to simulate the recharge of combined sewer overflows into a permeable, unconfined formation through a recharge well. The data showed that the relative decrease in permeability during recharge may be calculated by using the least-squares deviations between theoretical and experimental recharge surfaces. Decreases in piezometric surface level, rate of outflow, and permeability are a function of wastewater concentration, duration of recharge, and distance from the well. Chemical treatment is partially successful in redeveloping the formation. Recharge of water with 250 mg/l sodium hypochlorite at the end of a recharge period effectively reduced the clogging that was caused by microbial growth. (Visocky-ISWS) W75-05520

PROCESS CONTROL OF ACTIVATED SLUDGE

TREATMENT, PHASE II, Kentucky Water Resources Inst., Lexington. R. I. Kermode, R. W. J. Brett, and J. D. Pault, Jr. Available from the National Technical Informa-Avanaole from the National Technical Information Service, Springfield, Va 22161 as PB-240 176, \$4.75 in paper copy, \$2.25 in microfiche. Research Report No. 83, January 1975. 87 p, 29 fig, 14 tab, 14 ref. OWRT A-050-KY(1). 14-31-0001-4017.

Descriptors: *Waste water treatment, Mixing, Model studies, *Activated sludge, Environmental engineering, Mathematical models, Optimization, Quality control, Settling basins, *Sewage treat-Quality control, Settling basins, *Sewage treament, Microorganisms.
Identifiers: *Digital simulation, Process control.

Material balances on substrate and microorganisms were derived in conjunction with various mixing configurations thought to accurately describe the activated sludge process. These models include the completely mixed with bypass, plug flow, and plug flow with bypass. Two sets of kinetic mechanisms for substrate utilization and bacterial growth were employed. A feed forward controller was designed from linear approximations of the material balances derived in the completely mixed with bypass mixing model. Utilizing frequency response methods, the controller was found essentially identical to a completely mixed model controller developed in a prior investigation. Through computer simulation the controller's effectiveness was tested. The controller maintained suitable effluent quality principally through proportional control on the in-fluent flow rate. Additional proportional deriva-tive control on influent substrate concentration produced further reductions in substrate levels; however, when employing realistic forcing func-tions, these reductions were minor. Comparison of mixing models was dependent upon the degree of substrate loading inflicted on the system. Bypassing had a detrimental effect on effluent quality and process control. (Grieves-Kentucky) W75-05528

CHARACTERIZATION OF FRUIT AND VEGETABLE PROCESSING WASTEWATERS, Oregon State Univ., Corvallis. Dept. of Food Science and Technology. For primary bibliographic entry see Field 5B. W75-05534

BIOLOGICAL FILTERS, (LITERATURE

REVIEW), National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research

R. L. Bunch. Journal Water Pollution Control Federation, Vol 46, No 6, p 1121-1123, June, 1974. 25 ref.

Descriptors: *Trickling filters, *Filters, *Water quality, *Reviews, Industries, Model studies, Water Pollution Control Federation, Nitrogen, Plastics, *Bibliographies, *Filteration. Identifiers: Rotating biological disk process.

A review of the current literature demonstrates that the emphasis last year was on upgrading trick-ling filters to meet more stringent effluent requirements and to remove nutrients before discharge. Biological filters were used for nitrification and denitrification. Expressions for the perform of trickling filters were developed. The use of corrugated polyethylene sheets and PVC grids as packing for a biofilter was studied. Industrial applications for trickling filters were found. Mathe-matical models of the rotating biological disk process were formulated, with equations for both the dynamic and steady-state models. (Orr-FIRL) W75-05537

EXAMPLES OF WATER AND AIR PURIFICA-TION BY CATALYTIC REACTIONS TION BY CATALYTIC REACT (BEISPIELE FUER DIE REINHALTUNG REACTIONS

(BEISFIELE FORK DIE WASSER UND LUFT DURCH KATALYTISCHE REAKTIONEN), G. Vollheim, and J. Troeger. Devollheim, and J. Troeger. Devollheim, and J. Troeger. 1983-1992, 1974. 3 fig, 5 tab, 7 ref.

Descriptors: *Catalysts, Chemical industry, Environmental control, *Water purification, Chemical reactions, *Waste water treatment, *Industrial wastes, *Chemical.

Identifiers: *Catalytic reactions, *Air purifica-

The use of catalysts in the chemical industry permits factory processes to be carried out without harm to the environment. The reduction of nitroaromatic substances with the aid of iron and hydrochloric acid is contrasted with the reduction by hydrogen on a platinum-active carbon catalyst

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which produces no by-products harmful to the en-vironment. A special catalyst for production of halogenated aniline derivatives is described. Finally, the burning of waste gases is considered. (Sandoski-FIRL) W75-05540

INFILTRATION SMOKED-OUT, Gardner Water and Sewer Dept., Ill. For primary bibliographic entry see Field 8G. W75-05541

WATER OR AIR, WHICH DO YOU PUMP, FMC Corp., Indianapolis, Ind. Pump Div. For primary bibliographic entry see Field 8C. W75-05542

ASBESTOS REMOVAL SYSTEMS PERFECTED, Water and Waste Treatment, Vol 17, No 6, p 13, June, 1974.

Descriptors: *Asbestos, *Waste water treatment, *Potable water, Coagulation, Filtration, Polyelectrolytes, Filters, Public health, Costs, Water treatment, *Industrial wastes. Identifiers: Sand filters, Asbestos mining industry,

Treatment methods

Scientists at the Canada Centre for Inland Waters have assembled systems that can remove up to 99.8% of the asbestos fibers from drinking water. The treatment costs an estimated five cents per 1000 gallons. Ordinary sand filtration removes approximately 90% of the asbestos-like fibers in water. However, the remaining 10% consists of very small fibers which may present the greatest health hazard. The most effective system for removal of these fibers is coagulation and filtration used together with a polyelectrolyte. The polyelectrolyte acts to refine the precipitation and coagulation so that even the smallest asbestos parcoagunation so that even the similaries assession spiri-ticles are removed. This work has important impli-cations for the asbestos mining industry as well as for municipalities on affected waterways. (Orr-FIRL) W75-05543

TREATED EFFLUENT GOES 'UNDERGROUND', Water and Sewage Works, Vol 121, No 9, p 60-61, September, 1974. 2 fig.

Descriptors: *Waste disposal wells, *Injection wells, *Effluents, Sewage disposal, Water pollution control, Water management(Applied), Municipal wastes, Aeration, Operating costs, Legislation, Potable water, *Florida. Identifiers: West Palm Beach(Fla).

A new regional water pollution control facility for the City of West Palm Beach, Florida includes wells to inject treated effluent more than one half mile underground, rather than disposing of wastes through an ocean outfall. The secondary treated effluent will be disposed of by well injection into the boulder zone of the Floridan aquifer. A testing phase is now underway; a 3500 foot deep well will be constructed so that it can be used for test injecto constructes as that it can be used not rest injec-tion purposes and later as a monitoring well for the final disposal system. In addition, a 1200 foot deep well will tap an aquifer of saline water, which will be used as an injection well to dispose of the salt water that will be produced when the deep test hole is being drilled. The wells are part of an overall plan for treatment facilities capable of han-dling up to 128 million gallons of sewage per day. Separate management of sewage and storm water for the City of West Palm Beach and the Town of Palm Beach is planned. The projects will also test the capabilities of extended aeration on a very large size municipal treatment plant. The extended aeration, with long retention time in the aeration basin, is not subject to shock loading, and requires no highly skilled operations, thus reducing operational costs. The system has been designed to include growth potential and to meet federal effluent requirements for advanced treatment, essentially to the potable water stage by 1983. (Prague-FIRL) W75-05544

AUTOMATED MONITORING OF RECOVERED WATER QUALITY, For primary bibliographic entry see Field 5A. W75-05545

SMOKE TESTS DETECT SOURCES OF IL-LEGAL INFLOW,
Cincinnati Dept. of Sewers, Ohio.
For primary bibliographic entry see Field 8G. W75-05546

METHOD AND APPARATUS FOR PURIFYING M. D. Woods

United States Patent 3,837,800. Issued September 24, 1974. Official Gazette of the United States Patent Office, Vol 926, No 4, p 1347-1348, September 24, 1974. 1 fig.

Descriptors: *Patents, *Water purification, *Waste water treatment, *Ultraviolet radiation, Ir-Descriptors: radiation, Waste treatment, Sterility. Identifiers: *Radiation chambers

A technique for continuously purifying a fluid by the emission of ultraviolet rays is described. The apparatus consists of a body with a series of spaced, parallel, elongated, cylindrical radiation chambers; elongated, interconnected chambers with a height much less than the diameter of the radiation chambers; and elongated, ultraviolet ray emitting lamps mounted in jackets in the radiation chambers, extending from the front to the rear of the radiation chambers. Fluid for purification is received in an elongated chamber and spread into sheet-like flow and passed serially and transversely between the lamp jackets and the radiation chambers' walls. The fluid remains in the sheet-like flow between adjacent radiation chambers by passing through the interconnecting chambers. The purified liquid is discharged from the last radiation chamber. (Leibowitz-FIRL) W75-05551

LIQUID PURIFICATION APPARATUS AND

Pollution Control Inc., South Barre, Vt. (assignee) G. F. Humiston, and B. L. Cotton.

ed States Patent 3,837,491. Issued September 24, 1974. Official Gazette of the United States Patent Office, Vol 926, No 4, p 1265-1266, September 24, 1974. 1 fig.

Descriptors: *Patents, *Liquid wastes, Water pol-lution, *Water quality control, *Water purifica-tion, Separation techniques, Distillation, Sludge removal, *Waste water treatment. Identifiers: *Centrifugal separation, *Vacuum

distillation, Liquid purification

A method was developed for the continuous mechanical purification of a liquid containing solid and dissolved pollutants. A liquid chamber is charged with polluted liquid which is subjected to centrifugal separation and vacuum distillation. The centrifugal separation influences the removal of pollutants from the chamber, exposing more sur-face of relatively pure liquid for the vacuum distillation. A stationary housing comprises the purifi-cation apparatus, along with a cylindrical, circumferentially perforated screen member, concentri-cally arranged within the housing. Vanes inside the screen member are mounted for rapid rotation around the axis, for centrifugation of the liquid. A vapor outlet in the housing applies a vacuum to the liquid within the screen member. A sludge outlet in the housing provides for the removal of sludge from the housing. (Leibowitz-FIRL) W75-05552

DISCHARGE DEVICE FOR A VACUUM SEWAGE SYSTEM,

Aktiebolaget Cenenta, Malmo (Sweden) For primary bibliographic entry see Field 8C. W75-05553

NEW WATER WORKS FOR SUTTON For primary bibliographic entry see Field 5F. W75-05554

REVERSE OSMOSIS AND ULTRAVILTRA-TION,

Abcor, Inc., Cambridge, Mass. J. Del Pico, and P. W. White. Metal Finishing, Vol 72, No 8, p 29-31, August, 1974. 6 fig.

Descriptors: *Reverse osmosis, *Waste water treatment, *Water pollution, *Filtration, Semipermeable membranes, Industrial wastes, Separation techniques, Colloids, Water purification, Distillation.

Identifiers: *Ultrafiltration, Osmotic pressure,

Particulate matter, Membrane configuration.

The practical application of reverse osmosis and ultrafiltration now includes the concentration, purification and/or fractionation of a large spectrum of industrial streams. Both processes utilize a semi-permeable membrane as the separating agent, and pressure is used for the driving force to achieve separation. The semi-permeable mem-brane is considered a 'surface' filter, allowing the passage of water and some of the smaller sized solutes, while being capable of retaining larger solutes, particulates and colloidal matter. A counterpressure is produced, depending on the numeri-cal concentration of molecules retained by the membrane. This osmotic pressure must be overcome before water removal can occur. The nature of the membrane is the primary factor in determin-ing which species are retained, and which permitted passage. Ultrafiltration membranes, on the other hand, are relatively open membranes, retaining only large molecules and colloidal particles, allowing salts passage through the membrane with water. The osmotic counterpressure is low and operating pressures are usually below 100 psi, and throughput per unit area is 1 to 10 times greater than with RO membranes. The size of the molecule to be retained determines the type of membrane utilized. (Leibowitz-FIRL) W75-05556

PEAT MOSS: AN ALTERNATIVE ADSORPTION MEDIUM.

Water and Pollution Control, Vol 112, No 8, p 18, August 1974. 2 fig.

Descriptors: Water pollution, *Waste water treatment, *Peat, *Adsorption, *Filtration, Industrial wastes, Agricultural wastes, Activated charcoal, Surfactants, Dyes, Oil, Mercury, Proteins, Oil spills, Sewage treatment, Hydrogen sulfide, Iron, Zinc, Nickel, Copper, Ammonia. Identifiers: *Peat moss, Humic acids,

Dimethylamine.

The University of Sherbrooke, Quebec is studying the application of peat moss as effective filtration and adsorption medium, as an alternative to ac-tivated charcoal in pollution abatement. The price of peat at 3 to 4 cents per lb is desirable in com-parison with that of activated charcoal at 40-60 cents per lb. Peat moss is made up of decomposed tissue of various plants, primarily that of the genus Sphagnum, which can be found over an area of Sphagnum, which can be found over an area of about 37,000 square miles in Canada itself. It is a sponge-like, highly porous structure with an approximate surface area of 200 sq m/g. It is composed of humic acids, and provides cationic exchange properties. On a weight basis, peat moss' adsorptive capacity is significantly inferior o activated charcoal, but it has a positive comparison on an economic basis. This has prompted

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investigation into low efficiency application of peat moss in control of agricultural sewage and some industrial odors. Studies are being conducted on the use of peat moss filters in the treatment of industrial waste waters, since peat is known to adsorb oils in amounts 8 to 12 times its own weight. However, where there are surfactants in substantial numbers, the adsorptive capacity of peat moss is greatly diminished. Also under investigation is the application of peat moss in the adsorption of metals in industrial wastes. (Leibowitz-FIRL) W75-05557

EXTENSIONS TO HANNINGFIELD WORKS OF ESSEX WATER COMPANY.
For primary bibliographic entry see Field 5F.
W75-05558

DESIGN CRITERIA FOR WASTE STABILIZA-

Nova Scotia Technical Coll., Halifax.

D. Thirumurthi.

Journal Water Pollution Control Federation, Vol 46, No 9, p 2094-2106, September 1974. 6 fig, 3 tab,

Descriptors: *Design criteria, *Domestic wastes, Biochemical oxygen demand, *Oxidation lagoons, *Waste water treatment.

Identifiers: Environmental conditions, First-order BOD coefficient, Critical solar energy level.

Magnitudes of suggested design parameters for waste stabilization ponds are evaluated. A new system for determining design criteria, which insystem for determining design criteria, which in-tegrates theoretical concepts with experimental data, is presented in practical application. Waste stabilization ponds will be most efficient if designed to suit local conditions, and if the firstorder BOD coefficient, which is the key part of this model, is determined individually for each pond. (Nelson-FIRL) W75-05559

PROTESTING POLLUTION.

Chemical Week, Vol 115, No 7, p 14, August 14,

Descriptors: *Waste disposal, *Environmental control, Water pollution sources, Mine wastes, Industrial plants, Landfills, *Recycling.

Identifiers: *Land disposal.

An on-land disposal plan as an alternative to discharging wastes into Lake Superior has been rejected by a federal court against the Reserve Mining Company at Silver Bay, Minnesota. The taconite ore processing plant may be shut down if an alternate disposal solution is not agreed to shortly. One alternative is the moving of the processing plant nearer the taconite mine and recycling the wastes to the pits created by mining the ore. (Sandoski-FIRL) W75-05560

FLOCCULANTS FLOURISHING. Chemical Week, Vol 115, No 11, p 34, September

Descriptors: *Flocculation, *Waste water treatment, *Chemical industry, Chemical precipitation, Coagulation, Foreign research, Costs, Demand.
Identifiers: *Flocculants, *Japan, Chemical Economy Research Institute.

The demand for high-polymer flocculants in Japan in 1974 will be 9000 metric tons, an increase of 3600 metric tons over 1973. There is a predicted 30 percent growth in the demand for 1975. Predicted demand is 15,000 m.t. in 1976 and 18,000 m.t. in 1977. The major use of Japanese-produced org flocculants is for waste water treatment. Eighty percent of the high-polymer flocculants are produced from acrylamide. The oil crisis of 1973

caused the price of flocculants to increase to \$3.60-4.00/kilogram in the last months of the year. Labor cost increases have caused further creases in the flocculant price to \$4.00-4.60/kilogram. Major producers of chemical flocculants in Japan include Sanyo Chemical Industries, Sumitomo Chemical, and Asahi-Dow. These figures were reported by the Chemical Economy Research Institute, a private chemical research group. (Orr-FIRL)

SEWAGE SLUDGE CENTRIFUGING GETS SCOTTISH OK. Surveyer, Vol 4285, p 39-40, July 1974. 2 fig.

Descriptors: *Sludge disposal, *Centrifugation, *Polyelectrolytes, *Sewage sludge, Domestic wastes, Water pollution, *Dewatering, Septic tanks, Waste water treatment.

Identifiers: *Sewage sludge centrifuge, Vacuum filter, Capillary suction time.

The Scottish Development Department reports on full-scale trials to investigate the efficiency of centrifuging as a means of dewatering sewage sludges. The Lockerbie Composting Center has composed partially dewatered sludge with organic residue from domestic waste. Sludge enters the center at an average rate of 36.5 cu m per day from many sewage treatment works and a few septic tanks. The original vacuum filter dewatering plant, utilizing wood flour as filter medium, processes sludge at a maximum rate of 5 cu m per hour. An hour is at a maximum rate of 5 cu in per nour. An nour is required to prime the filter drum, being effective only 4 1/2 hours. A machine was installed of the solid bowl scroll discharge type, with a rated capacity between 6 and 10 cu in per hour. Polyelectrolyte is added to help flucculation. It is fed into the machine so that mixing and floc formation occur within the feed zone. Experiments with the sewage sludge centrifuge were performed with various pond depths, polyelectrolyte dosing rates and concentrations, centrate quality, and the rates and concentrations, centrate quanty, and the applicability of the capillary suction time technique in the assessment of appropriate polyelectrolyte dosages. At Lockerbie, sludge cakes are composted with domestic organics in a biostabilizer. There has been no apparent diminution in composting activity, nor has any biological inhibition from the usage of polyelectrolytes been noted. (Leibowitz-FIRL)
W75-05562

CONDENSATE TRAPPING ALLEVIATES POL-

Electrical World, Vol 182, No 3, p 44-46, August 1,

Descriptors: *Water pollution, *Water quality control, *Water reuse, Oil pollution, Sludge disposal, Drainage systems, *Waste water treat-

Identifiers: *Condensate trapping, Trap-drain con-densate-reclamation system, Heating-system trap drains, Cartridge filter, Precoating.

A trap-drain condensate-reclamation system has been perfected by engineers at the Public Service Electric and Gas Company, Burlington, New Jersey. Operating costs have been decreased by \$20,000, and the system controls pollution problems originating in plants where heating-system trap drains are dumped into local waterways. A unit was sought that would detect and prevent contaminants from getting into the condensate-storage system during the drain recovery.

A cartridge-type replaceable filter was examined for alerting engineers to high levels of contami-nants in the condensate. The conclusions reached by experimentation were: about one-million gal-lons could be filtered between cartridge changes in a unit designed for a maximum flow of 100 gpm, where a particle selection size would be one micron with a cartridge outside diameter of 2.75 in.; the cartridge filter would retain fuel oil entrained in the condensate; and, precoating would be unnecessary filtering, although it could lengthen the required time between cartridge-element changes. In the event of condensate-reclamation system malfunctioning, the filter-differential alarm, conductivity alarm, oil-detector alarm, power-failure alarm and high-and-low-level alarms were installed as part of the continual operating. (Leibowitz-FIRL)

DISINFECTION: THE LAST LINE OF DEFENSE FOR POTABLE WATER, For primary bibliographic entry see Field 5F. W75-05564

THE DESIGN AND CONSTRUCTION OF AYCLIFFE SEWAGE WORKS EXTENSIONS, H. R. Brooksbank, and J. M. Dyson. Water Pollution Control, Vol 73, No 4, p 367-368,

Descriptors: *Sewage treatment, *Waste water treatment, Water pollution, *Industrial wastes, Water quality control, Biological treatment, Sludge treatment, Domestic sewage, Effluent control, *Design, *Construction, Treatment facilities, Settling basins

Identifiers: Biological filters, Humus tanks, Sludge storage tanks, Sludge-drying beds, Heated sludge digestion, Recirculation pumping station, Storm tanks.

In 1941, the Aycliffe sewage works was con-structed to serve a Royal Ordinance Factory; after the war it was taken over by the Board of Trade as an industrial estate. From this estate, sewage was discharged to the sewage works. When the land was bought by the Darlington Rural District Counwas bought by the Darangton Rural District Council to provide sewage treatment facilities for Newton-Aycliffe in 1950, the works contained 1 screen, 3 rectangular sedimentation tanks, 4 biological filters, 4 humus tanks, 2 pumping stations, 4 sludge storage tanks and sludge-drying beds, with a capacity of 2.275 x 1000 cu m/d DWF. These sewage works were modified in 1964 to service the appropriate of 2000 the approximation with vice the population of 20,000 in the new town, with an increased water flow from the industrial estate. A separate plant was built to the north to enable a gravity system to be used. This new operation comprised preliminary treatment, storm tanks, 2 circular sedimentation tanks, 4 biological filters, 2 humus tanks, recirculation pumping station, heated sludge digestion and sludge-drying beds. The new capacity was 3.68 x 1000 cu m/d DWF. (Leibowitz-FIRL)

4632 TDS REDUCED TO 322 BY REVERSE OS-MOSIS P. B. Wold.

Water and Sewage Works, Vol 121, No 7, p 67,

Descriptors: *Reverse osmosis, Water pollution, *Membrane processes, Water quality control, Ion exchange, Bacteria, Electrodialysis, *Dissolved solids, *Waste water treatment. Weter treatment. Identifiers: Hollow nylon fiber membrane treatment system, Pemeators, *Total dissolved solids(TDS).

Reverse osmosis was used to convert water with 4,000 ppm total dissolved solids to water of the described by the Environmental Protection Agency and the North Dakota State Health Department as potable. It was determined that systems based on the hollow nylon fiber devices were feasible because of the fiber membrane's re-sistance to high and low pH and bacterial degradation. An operating pressure of 400 psig or lower was required. Smaller space is needed for a hollow fiber membrane system. Included in the system was a sand filter for removing suspended solids

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from the feed water. Hardness is removed by a weak acid ion exchange installation. The reverse osmosis system can remove 90 to 95 percent of the dissolved solids, based upon the DuPont 'Permasep' permeaters. Rejected water is used for the regeneration of the ion exchange unit and sand filter backwash. Under consideration is the use of the reject water for spraying gravel roads for dust control. This water should contain over 25,000 ppm TDS, many of which are deliquescent in na-ture. (Leibowitz-FIRL) W75-05566

CADMIUM ACCURAL IN A COMBINED WASTEWATER TREATMENT-AQUACULTURE SYSTEM.

GREATH,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W75-05580

FOAM AND BUBBLE FRACTIONATION FOR REMOVAL OF TRACE METAL IONS FROM

WATER, California Univ., Berkeley. Dept. of Chemical En-

gineering. E. Valdes-Krieg, C. J. King, and H. H. Sephton. In: Environmental Protection Agency, Conference on Traces of Metals in Water, Removal and Monitoring, November 16, 1973, Princeton, N.J., 22 p. 9 fig, 13 ref. 14-30-2919.

Descriptors: *Desalination, *Waste water treatment, *Heavy metals, *Foam fractionation, Bubbles, Water pollution, Regression analysis, Ion exchange, Adsorption, Electrochemistry, Isotherms, Distribution, Evaporation, Surfactants, Copper, Volumetric analysis, Laboratory analysis, Gradients, Regeneration Identifiers: Regeneration.

The work reported has been concerned with the removal of surfactants and copper from the effluent blowdown brine of evaporation seawater desalination plants. The research has been carried out in connection with the development of a process using surface-active agents to enhance the heat-transfer coefficient and reduce the pressure drop in vertical-tube, upflow evaporation. Foam drop in vertical-tube, uption evaporation. Foam and bubble fractionation are used to recover and remove the surfactant from the effluent brine. The removal of copper is also of importance since copper enters the water through corrosion and is at a level (about 0.5 ppm) high enough so that it may be deleterious to marine life if the brine is returned directly to the ocean. Foam and bubble feasitionation are according to the contract when the contract with fractionation experiments have been carried out in apparatus of various sizes, including (1) a 2 1/2 in. diameter, 6-ft high column, (2) a 1-ft square, 7-ft high column, and (3) a 4-ft square x 9-ft high chamber. Data obtained with the smaller column cammer. Data obtained with the smaler column are reported here. Results for surfactant removal with the 1-ft square column are reported el-sewhere. The surfactant employed has been Neodol 25-3A (Shell Chemical Co.), which is the ammonium salt of a sulfated primary alcohol with three ethylene oxide units and a C12 to C15 alkyl group. (Rowe-Vanderbilt)

LABORATORY STUDIES ON FEEDLOT RU-NOFF, Nebraska Univ., Lincoln. Dept. of Civil Engineer-

T. J. McGhee, L. R. Christenson, and W. R.

Bonneau. Journal of Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE6, p 883-896, December, 1973. Proceedings Paper 10205. 8 fig, 5 tab, 16 ref. OWRR OWRT A-027-NEB(8).

Descriptors: "Feed lots, "Agricultural runoff, "Farm wastes, "Waste treatment, Sedimentation, Retention, Biochemical oxygen demand, Aeration, Activated sludge, Adsorption. Identifiers: Color removal.

Effective treatment of settled feedlot runoff may be obtained at liquid retention times of 2 days with a positive solids return activated sludge system. The oxygen demand of feedlot runoff is not mea-sured adequately by the 5 day biochemical oxygen demand determination but may be approximated from the chemical oxygen demand determination.
The oxygen uptake of feedlot runoff as measured in the Warburg apparatus is a power function of time for at least 90 days. Removal of color is possible by adsorption on both activated carbon and clayey fine sand. Pretreatment is important since the adsorptive capacity of any such medium is limited. (Cartmell-East Central) W75-05607

AUTOMATIC CONTROL OF LARGE-SCALE COMBINED SEWER SYSTEMS, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering.

J. W. Labadie, N. S. Grigg, and B. H. Bradford. Journal of the Environmental Engineering Divi-sion, American Society of Civil Engineers, Vol 101, No EE1, Proceedings paper No. 11115, p 27-39, February 1975. 7 fig, 23 ref. OWRT C-4172(9028)(5).

Descriptors: "Water pollution control, "Combined sewers, "Overflow, "Automatic control, "Waste water(Pollution), "Management, Optimization, Computers, Drainage, Environmental engineering, Constraints, Hydrology, Reservoir storage, Treatment facilities, Biochemical oxygen demand, Rainfall-runoff relationships. Linear proment facilities, Biochemical oxygen demand, Rainfall-runoff relationships, Linear pro-gramming, Stochastic processes, Pollutants, Simu-lation analysis, Hydraulics, Equations, Mathe-matical models, Systems analysis, California. Identifiers: *Decomposition techniques, Aggrega-tion approach, *Hierarchical control, San Fran-cisco(Cal), Receiving waters.

The pollution of receiving waters by overflows from combined sewers is a national problem of serious concern. A recent viable solution strategy for the problem involves the development of auto-matic control systems as an alternative to more expensive sewer separation or large-scale treatment projects. Development of the control logic is dif-ficult, due mainly to the size and complexity of the problem. To deal with this complexity, a hierarchical control strategy is developed and applied to the proposed San Francisco Master Plan for Waste-water Management. The large-scale optimization problem is decomposed into several first-level subbasin problems, with a second level master problem tying them together. An aggregation approblem typing their together. An aggregation approach is also presented as an alternative means of developing a hierarchical control structure. The subbasin problems can be solved either on-line or off-line, depending on the complexity of the sewer transport models utilized. The advantages of both transport models utilized. The advantages of both the decomposition and the aggregation approaches are: (1) more efficient optimization; (2) considerable lessening in required core computer storage; (3) flexibility in utilizing totally on-line optimal control, or a mixture of off-line and on-line opcontrol, or a mixture of of-line and on-line op-timization; (4) less complexity in software design through decomposition into several simpler tasks; and (5) compatibility with hierarchical computer control. (Bell-Cornell) W75-05608

CHANGES IN CONCENTRATION OF CERTAIN CONSTITUENTS OF TREATED WASTE WATER DURING MOVEMENT THROUGH THE MAGOTHY AQUIFER, BAY PARK, NEW

YORK, Geological Survey, Mineola, N.Y. For primary bibliographic entry see Field 5B. W75-05625

NITRIFICATION EFFECTS IN WASTE TREAT-

NITRIFICATION EFFECTS IN WASTE TREAT-MENT PROCESSES, Rutgers - the State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering. T.J. Olenik.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 278, \$7.25 in paper copy, \$2.25 in microfiche. PhD Dissertation, February 1974. 197 p, 51 fig, 10 tab, 77 ref, append. OWRT A-035-NJ(2). 14-31-0001-

Descriptors: *Nitrification, Stochastic processes, Mixing, Water quality control, *Waste water treat-ment, Nitrates, Nitrites, Time series analysis, Dispersion, Diffusion, Model studies, Ammonia, *Biochemical oxygen demand, *New Jersey, Dissolved oxygen, Statistical models.
Identifiers: *Passaic River(NJ).

Nitrification or second-stage Biochemical Oxygen Nitrification or second-stage Biochemical Oxygen Demand (BOD) effects were investigated in two wastewater treatment plants along the Passaic River in New Jersey. The two plants, Berkeley Heights and Madison-Chatham, were analyzed by simultaneously performing long-term Dissolved Oxygen (DO) and inorganic nitrogen tests of internal and external flows. The results showed that with first orders not take alone on an overall basis. nitrification does not take place on an overall basis at either plant. The disappearance of ammonia nitrogen noticed in the long-term DO test was con-sidered to be caused mainly by the heterotrophic bacteria, and to a small extent, by the nitrifying autotrophic bacteria. Kinetic rate constants were determined for all effluents at each plant. A tracer study was performed using lithium chloride on the mechanical aeration unit at the Madison-Chatham plant. The purpose of this tracer study was to determine the amount of dead space in the tank that may allow nitrifying organisms sufficient generation time to multiply. A direct result of this testing was a mathematical model of the system based on Wilson's 'black-box' approach. The receiving water (Passaic River) was analyzed for its deterministic and stochastic properties for am-monia-nitrogen values obtained from the Passaic Valley Water Commission. Two years of data at three points along the river were studied by time-series analysis. The results showed that the ammonia-nitrogen values were randomly distributed in time and correlated to some extent in space. (Ahlert-Rutgers) W75-05661

DESIGN OF AN EXPERIMENTAL SYSTEM FOR STUDYING PHYSICAL-CHEMICAL TREATMENT OF WASTEWATER AT ELEVATED TEMPERATURES,

Arizona Univ., Tucson. Dept. of Nuclear Enneering.

Master's Thesis, 1974. 59 p, 11 fig, 8 tab, 11 ref, 2

Descriptors: *Waste water treatment, *Sewage treatment, *Reclaimed water, Nuclear power plants, Cooling water, Temperature, *Design, Pilot plants, Coagulation, Activated carbon, Adsorption, Costs, Treatment facilities.

Identifiers: *Heated sewage, *Physical chemical

treatment, Clarification.

A design is developed for a 10 gpm experimental system in which heat is used to enhance the physi-cal-chemical treatment of domestic wastewater. cal-chemical treatment of domestic wastewater. The results of experiments conducted in the Civil Engineering Department, University of Arizona, and pilot plant studies, all employing powdered activated carbon and a metal coagulant, are present and served to define the major design and operational criteria. The design incorporated a specially constructed wastewater heating unit and two commercially available treatment units which are utilized as an Adsorption System and a Clarification System. Some features of this design which make it suitable for experimental investigation are: (a) Flow and operational flexibility, (b) Automatic operation, (c) Minimum of operator attention, (d)Ease of Maintenance (e)Control equipment affords protection and safety against abnormal fords protection and safety against abnormal operation. A preliminary estimate of the fixed cost is \$41,250 with daily operating costs of \$66.

Group 5D—Waste Treatment Processes

ACID MINE DRAINAGE WATER MADE FIT TO DRINK, Public Works, Vol 105, No 9, p 120, September,

1974. 1 photo.

Descriptors: *Mining, *Mine acids, *Potable water, Drainage, Water quality control, *Ion exchange, Heavy metals, Chemical reactions, Oxidation, Aeration, Neutralization, Water soften-ing, Filtration, Resins, *Acid mine water, *Waste water treatment, Mine drainage.

The use of ion exchange processes for the treatment of water contaminated by acid mine drainage was discussed. Using this process, a plant in central Pennsylvaina converts 800,000 gpd of acid water into potable water and is expected to reach one million gpd within the year. The ion exchange process used in the plant was originally developed to treat brackish water and recently modified to meet the needs of acid mine drainage treatment by using amberlite ion exchange resin beads that exchange carbonates for sulfates in sulfuric acid and metal sulfates. (Jernigan-Vanderbilt) W75_05688

INDUSTRIAL WATER PRETREATMENT, Calgon Corp., Pittsburgh, Pa. Water Management

F. H. Seels Chemical Engineering, Deskbook Issue, p 27-32, February 26, 1973. 6 fig, 2 tab, 14 ref.

Descriptors: *Industrial *Pretreatment(Water), *Water quality, *Economics, Industrial plants, Decision making, Clarification. Lime, Iron, Manganese, Filtration, Adsorption, Ion exchange, Reverse osmosis, Sludge disposal, *Waste water treatment.

Usually, the purpose of water pretreatment is the removal of selected impurities before placing the water into industrial service. Typically, this means the removal of suspended solids or scale-causing minerals, and adjustment of the pH. Pretreatment costs vary with local conditions. While many plants acquire the benefit of at least partial pretreatment through the purchase of municipal water, other industrial installations obtain water from lakes, rivers and wells. These industries must implement pretreatment programs from the beginning. A key factor in industrial water management is determining which water problems should be solved system-wide with pretreatment, and which should be solved more selectively by the addition of chemicals to the water-using processes. Pretreatment operations discussed were: clarification; lime softening; iron and man-ganese removal; filtration; adsorption; ion exchange; reverse osmosis; and some other less used techniques, such as electrodialysis, ultrafil-tration, and electronic devices. Waste products that result from the various pretreatment processes are also discussed. (Pulliam-Vanderbilt) W75-05695

METHODS FOR THE ANALYSIS AND IDENTIFICATION OF ORGANOLEPTIC SUB-STANCES IN THE TECHNOLOGICAL PROCESS OF WATER TREATMENT (RAZRABOTKA METODOV ANALIZA I IDENTIFIKATSII ORGANOLEPTICHESKIKH VESHCHEST' V TEKHNOLOGICHESVAN PROTESSES BANGAROLEPTICHESKIKH PROTSESSE PODGOTOVKIVODY),
For primary bibliographic entry see Field 5A.
W75-05724

THE SECLAR PROCESS AND ITS APPLICA-TIONS IN PAPERMAKING (LE PROCEDE SECLAR AT SES APPLICATIONS EN PAPETERIE),

P. Lejeune, and J. Serpaud.
ATIP (Association Technique de l'Industrie ATIP (Association Technique de l'Industrie Papetiere) Revue, Vol 28, No 5, p 237-245, 1974. 2

Descriptors: *Pulp wastes, *Treatment facilities, Equipment, *Waste treatment, *Water purifica-tion, Flocculation, Effluents, Pilot plants, Industrial wastes, Water pollution sources, Pulp wastes, Chemical precipitation, Sedimentation, Sludge, Pulp and paper industry.
Identifiers: Seclar clarifier, *Clarifiers.

After an introduction to the problems involved in paper mill effluent clarification and a review of various types of clarifiers and flocculating agents used in such clarification, the Seclar clarifier is described. This apparatus consists essentially of a flocculation chamber, where the effluent is fed in, a clarification chamber where a filtering fluidized bed of sludge is formed at the bottom and clarified effluent is led off at the top, and a sludge removal chamber. Results obtained with three pilot-plant units in processing paper mill effluents are reviewed. (Speckhard-IPC) W75-05726

PROBLEM-FREE CLARIFIER SLUDGE TREATMENT (PROBLEMLOSE KLARSCHLAMMBEHANDLUNG), W. Vogeno. Allgemeine Papier-Rundschau, No 24/25, p 712,

717, June 20, 1974. 2 fig.

Descriptors: *Sludge treatment, *Sewage sludge, Equipment, *Pulp wastes, Waste water treatment,

Water pollution sources, Sludge disposal, Drying, Incineration, Pumping, Dewatering, Wastes, Waste disposal, Solid wastes, Treatment facilities,

A new two-stage (drying/combustion) process for processing clarifier sludges of a wide range of compositions and moisture contents is described. In the case of pumpable sludges, the system consists of a sludge heater, a sludge pump, a drum sists or a studge neater, a studge pump, a drum dryer, a multi-tier oven, a fan, and a heat exchanger. Most of the hot gases produced in the oven are used in the drum dryer; the rest go to the heat exchangers. For handling of sludges which are too dry for pumping, the system includes a double-shaft mixer, hammer mill, and separating cyclone in feeding the sludge to the combustion chamber. (Speckhard-IPC) W75-05727

ASSESSING THE CAPABILITY OF THE EVER-GLADES MARSH ENVIRONMENT FOR RENOVATING WASTEWATER, Agricultural Research Service, Fort Lauderdale,

K. K. Steward, and W. H. Ornes. Available from the National Technical Informa-tion Service Springfield Va. 22161 as PB-231 652 \$3.75 in paper copy, \$2.25 in microfiche. Ecological Report No DI-SFEP-74-06, May 1973. 27 p. 7

Descriptors: *Water reuse, *Marshes, *Waste water treatment, Florida, Plant physiology, Primary productivity, Fertilization, Plant growth, Aquatic plants, Absorption, Eutrophication, Aquatic plants, Absorption, Eutrophication, Feasibility studies, Vegetation, Nutrient removal, Sediments, Nitrogen, Phosphorus, Potassium. Identifiers: Everglades(Fla), Sawgrass.

A portion of the Water supply to Everglades National Park has been threatened by construction of an international jetport and with the subsequent industrial and residential development of lands bordering the park. There have been suggestions that the fresh water marshes of the Everglades might be used to renovate waste water from the coastal cities as a means of recycling and conserving fresh water now lost in the ocean. Everglades sawgrass was enriched with simulated effluents in order to determine the feasibility of recycling wastewater through the marshes. Weekly applica-tion of nutrients increased assimilation of nutrients by the plants but did not increase growth.
Only 12% of the applied nutrients were assimilated

into the vegetation. Of the amount remaining, 3% was used to produce algal blooms, 43% settled to the bottom, 55 remained dissolved in the water, and 37% was unaccounted for. The dense algal blooms, which were maintained throughtout th experiment, were believed to have been responsible for the disappearance of several floral components of the ecosystem. It appeared unlikely that the marsh system could be used to renovate wastewater. (Jones-Wisconsin) W75-05743

INVESTIGATIONS INTO THE MINERAL NUTRITION OF SAWGRASS USING EXPERI-MENTAL CULTURAL TECHNIQUES, Agricultural Research Service, Fort Lauderdale,

K. K. Steward, and W. H. Ornes

Available from the National Technical Information Service Springfield Va 22161, as PB-231 609, \$3.25 in paper copy, \$2.25 in microfiche. National Park Service, Atlanta, Ga., Ecological Report No DI-SFEP-74-05, May 1973. 11 p. 7 fig, 3 tab, 18 ref.

Descriptors: *Aquatic plants, *Nutrient requirements, *Cultures, *Waste water treatment, Phosphorus, Rooted aquatic plants, Reproduction, Marsh plants, Growth rates, Limiting factors, Florida, Waste water disposal, Water reuse. Identifiers: *Sawgrass, *Everglades (Florida).

The mineral nutrient status of sawgrass plants (Cladium jamaicense (Crantz)) in the field were determined and their response to nutrient enrichment through the use of experimental culture techniques. Nutrient requirements as well as nutrient status of field plants were estimated through the use of tissue analysis procedures for determining critical nutrient concentration of the elements. This technique is based on the assump-tion that an essential element must be contained in the plant at a concentration sufficient for plant growth. Additions of small quantities of phosphorus produced significant increases in dry weight, shoot length, and vegetative reproduction of new plants. Growth responses of seedlings were highly related to P levels in tissues. Ther appeared to be an optimum P level in tissue, however, as higher levels inhibited dry-matter production shoot elongation, and new shoot production. This was a significant finding, indicating that serious consequences may result from discharging nutrient-rich waters into the Everglades marshes. Critical P concentration was determined to be the field. It was concluded that experimentally determined critical nutrient levels do not adequately diagnose the nutrient status of plants in the field. (Jones-Wisconsin) W75-05750

SEWAGE TREATMENT PLANT DEPENDABILITY WITH SPECIAL REFERENCE TO THE ACTIVATED SLUDGE PROCESS,

National Field Investigations Center, Cincinnati, Ohio. Sewage Treatment Plant Operation and Design Branch. A. W. West.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-231 600, \$3.25 in paper copy; \$2.25 in microfiche. March 1971, 12 p

Descriptors: *Sewage treatment, *Activated sludge, *Design, Treatment facilities, Technology, Control, Systems analysis, Pilot plants, Personnel,

A reference for Plant Dependability is based on first-hand operational experiences at dozens of sewage treatment plants, and covers design feagoverned plant performance and final effluent quality. It is an expression of the writer's personal convictions regarding treatment plant design and operation concepts. Designers should select the

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

proper treatment process, provide generous capacity, provide essential flexibility, and make the plant truly controllable. Process features to be evaluated would include the Classic Activated Sludge Process design, the Complete Mix modification, and the Step Aeration modification. Pilot studies may be needed to resolve uncertainties. Design capacity should permit satisfactory plant performance at full load with either one aeration tank or one final clarifier out of service for maintenance. The activated sludge system is a control-lable process that must include appropriate meters and accurately controllable gates, valves, pumps, and blowers for optimum performances. Qualified operators are needed to achieve the high quality effluent that can be produced by properly designed waste treatment plants. (Jones-Wiscon-W75-05751

LITERATURE SURVEY OF INSTRUMENTAL MEASUREMENTS OF BIOCHEMICAL OXYGEN DEMAND FOR CONTROL APPLICA-TION 1960-1973,

National Environmental Research Center, Cincinnati, Ohio. Methods Development and Quality Assurance Research Lab.

R. J. O'Herron. Report EPA-670/4-74-001, February 1974. 31 p, 50

Descriptors: *Instrumentation, *Biochemical oxygen demand, *Waste treatment, Measurement, Reviews. Identifiers: Process control.

The 'state of the art' of instrumental biochemical oxygen demand methods in the waste treatment field is presented. Urgently needed is an online biochemical oxygen demand instrument suitable to control the treatment process. A new standard, amenable to instrumental measurement, is criti-cally needed to supplant the BOD test for measurement of waste water loading. In addition, the standard should be independent of microbiological activities and their inherent uncertainties, although it must show the results of biological acatthough it must show the results of biological ac-tion because, presently, secondary treatment plants are almost exclusively biological. Prospects for process control of waste treatment plants ap-pear favorable if differential measurement capa-bilities can be further developed. If rapid, reproducible removal of BOD to an acceptable value can be accomplished, differential measurements can give information of the ultimate BOD in less than I day. Instrumental TOC, TOD, and COD can already be determined in less than 5 minutes. Detention times for secondary waste treatment would add 6 to 8 hours. The additional processing method and b to 8 hours. The additional processing method and detention time would be the subjects of further research. The method of choice would be biological filtration in which various filtration media, and biological activation techniques would be pursued. (Jones-Wisconsin) W75-05753

PHYSICAL-CHEMICAL TREATMENT AT ELEVATED TEMPERATURES, Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.

N. W. Wright.
Available for the state of t

Available from the National Technical Informa-Two Service, Springfield, VA 22161 AS PB-240 300, \$4.75 in paper copy; \$2.25 in microfiche. Master's Thesis, 1974. 67 p, 18 fig, 2 tab, 39 ref. OWRR A-044-ARIZ(3). 14-31-0001-3803.

Descriptors: *Waste water treatment, *Sewage treatment, *Reclaimed water, Nuclear power plants, Cooling water, Temperature, Sludge, Turplants, Cooling water, Temperature, Studge, bidity, Chemical oxygen demand, Phosphates, Hydrogen ion concentration, Iron, Adsorption. entifiers: *Heated sewage, *Physical-chemical treatment, Clarification.

The effect of operating temperature on the physical-chemical treatment of domestic wastewater. using ferric chloride and powdered activated car-bon, at temperatures between 24C (75F) and 74C (165F) was explored. A single step operation that nbined chemical clarification and adsorption of dissolved organic material was used and the effect of temperature on the following parameters was observed: turbidity, COD (total and soluble), residual phosphate, pH and sludge characteristics. The results showed that optimum operating temperatures do exist for individual parameters ob-served, and that increased operating temperature was not beneficial to all parameters. Iron concentration was shown to have an important effect on optimum operating temperature. W75-05763

WATER SUPPLY, TREATMENT, DISTRIBU-TION, AND REUSE OPTIMIZATION IN ARID URBAN AREAS, Colorado State Univ., Fort Collins. Dept. of

Agricultural Engineering.
For primary bibliographic entry see Field 6A. W75-05773

REGIONAL WASTEWATER MANAGEMENT: A WATER QUALITY EVALUATION OF SYSTEM CENTRALIZATION, Northwestern Univ., Evanston, Ill. Dept. of Civil

Engineering.

PhD. Dissertation, August 1973. 352 p, 36 fig, 46 tab, 297 ref, 3 append. OWRR A-050-ILL(2). 14-31-0001-3513.

Descriptors: Dissolved oxygen, Costs, *Water quality, Management, *Regional analysis, *Waste water treatment, Economics, Planning, Systems analysis, *Illinois, Stochastic processes, Simula-tion analysis, *Evaluation, Model studies. Identifiers: Chicago(Ill).

A water quality evaluation of regional wastewater system centralization was undertaken to test the hypothesis that water quality improvement may result from the spatial and temporal variations of wasteloads attributed to decentralized regional systems. The evaluation employed water quality models developed for both deterministic and stochastic analyses. Each analysis considered a set of experiments which involved a determinination of the water quality resulting from alternative degrees of regional wastewater aggregation. The experiments treated not only the degree of aggregation or equivalently the number of plants in the system but also the stream system length as an indicator of regional morphology and the streamwater/wastewater dilution ratio as an indicator of relative stream size. The water quality assessment was made in terms of the minimum dissolved oxygen level experienced by the system. With a water quality evaluation of regional wastewater system centralization completed, an economic evaluation was undertaken. Cost functions for regional wastewater system components were developed, and costs of the physical systems hypothesized in the water quality analyses were estimated with these cost functions. Finally, a comparison was made between the water quality impact of various regional wastewater systems and the economic impact of these systems. It was concluded that substantial benefits, both economic and water quality, may result from decentralized regional wastewater systems. W75-05775

COMBINED BUOYANCY AND BOUNDARY EF-FECTS ON THE TRAJECTORY OF A TWO-DIMENSIONAL JET, Connecticut Univ., Storrs.

For primary bibliographic entry see Field 5B.

REMOVING IN EXCESS OF 99% PHOSPHORUS AT ELY, MINNESOTA, Graver Water Conditioning Co., Union, N.J. For primary bibliographic entry see Field 5C. W75-05796

AN EXPERIMENT IN THE EUTROPHICATION OF TERRESTRIAL ECOSYSTEMS WITH SEWAGE: EVIDENCE OF NITRIFICATION IN A LATE SUCCESSIONAL FOREST, Brookhaven National Lab., Upton, N.Y. G. M. Woodwell, J. Ballard, J. Clinton, M. Small,

and E. V. Pecan.

Available from the National Technical Inform tion Service, Springfield, Va. 22161, as BNL-18797, \$4.00 paper copy, \$2.25 microfiche. Report BNL 18797 (undated). 14 p, 5 fig, 2 tab, 17 ref.

Descriptors: *Soil disposal fields, *Sewage treatment, *Nitrification, Soil filters, Nutrients, New York, Fertilization, Percolation, Groundwater, Irrigation, Vegetation, Waste water disposal. Identifiers: Long Island(NY.)

An alternative to the present practice in sewage treatment is to use natural or lightly managed ter-restrial and aquatic ecosystems singly or in combination as living filters to remove nutrients and release potable water to either ground or surface water channels. The potential for each of the major communities of the terrestrial sere for absorption of the solids and nutrient elements in sewage and for the release of clean water was in-vestigated. Plots included an agricultural field, and three communities that together span the field-to-forest sere of central Long Island, represented by old field, pine forest, and oak-pine forest. The pine forest was a naturally seeded stand of pitch pine about 25 years old. Various types of sewage effluents were applied by spray irrigation equip-ment. It is concluded that natural and agricultural communities can be used to treat sewage. Examination should be made of how harvest of nutrients is to be accomplished most effectively to avoid the accumulation of salts to the point wh losses equal inputs. Any treatment system will require more than one plant community but there is little basis now for speculation as to the combinations that will prove most useful. (Jones-W75-05804

SULFIDE CONTROL IN SANITARY SEWERAGE SYSTEMS. Environmental Protection Agency, Washington, D.C. Technology Transfer Staff. Process Design Manual, October 1974. 137 p, 38

fig, 10 tab, 71 ref.

Descriptors: *Sulfides, *Sanitary engineering, *Sewerage, Hydrogen sulfide, Physicochemical properties, Odor, Toxicity, Analytical techniques, Oxygen, Industrial wastes, Design criteria, Sewers, Corrosion control.

This manual provides the engineering community and related industry a new source of information to be used in the control of corrosion and noxious conditions resulting from hydrogen sulfide in existing sewerage systems, and in the develope of designs for new systems so as to keep them free from these problems. The forms of sulfide in wastewaters, physical-chemical properties of hydrogen sulfide, odor and toxicity of hydrogen sulfide, and the analytical methods are given. Sulfide is sometimes present in wastewaters added to sewers, particularly in certain industrial wastes, and in rare instances groundwaters with high sulfide concentrations have leaked into sewers, but the commonest source of sulfide is biological ac-tivity in the sewer. The obnoxious odor of this in the sewer. The odnoxious odor of hydrogen sulfide escaping from manholes, pump stations, and wastewater treatment plants is the most potent objectionable characteristic of septic sewage. One effect is the adverse reaction of the activated sludge process. The growth of filamen-

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tous organisms, especially Thiothrix, is encouraged by the presence of sulfide. The sulfide concentrations that are found in sewers are closely related to the design of the system. (Jones-Wisconsin)
W75-05808

INVESTIGATIONS ON FILTER HEADLOSS, Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.

Engineering. P. V. Rao, R. N. Sen, and B. Bhattacharyya. Journal of the Institution of Engineers (India), Vol 54, No PH2, p 66-70, February 1974. 7 fig. 10 ref.

Descriptors: *Head loss, *Darcy's Law, Filtering systems, Suspended solids, Flow rate, Hydraulics, Sands, Hydraulic gradient, *Filters, Filtration. Identifiers: *Darcy's permeability coefficient, *Rapid sand filter.

An important parameter of restraint for the working of a rapid sand filter is headloss development, associated with the retention of suspended solids. A correlation has been made of the time rate of change of headloss with sand size and flow rate of a filter. Darcy's permeability coefficient was utilized as a filter performance parameter. The longevity of a filter may be improved if the rate of increase of headloss is reduced during the filter run by proper combination of sand size and rate of flow. (Leibowitz-FIRL) W75-05809

PLASTIC FILTER TRICKLING BED WASTE WATER TREATMENT (IN JAPANESE),

Shokuhin Kaihatsu, Vol 9, No 7, p 32-35, July 1974. 2 fig. 4 tab.

Descriptors: *Trickling filters, *Waste water treatment, Plastics, Biochemical oxygen demand, Sludge treatment, Aeration, *Biological treatment, Filters, Filtration.

The trickling filter bed method of waste water treatment utilizes propagation of aerobic bacteria on a filter of large mesh, thus contacting bacteria with organic waste water. The system is similar to other types of biological treatment, but compared with the activated sludge method which results in 0.4-0.6 kg(SD)/kg BOD, the trickling bed method gives 0.3-0.4 kg(SD)/kg BOD. If suspended solids and oil content are large, pretreatment is necessary to reduce oil to about 30 ppm; if an oil film does not form, there is no problem. If nutrients are lacking in the waste water, about 5 portions of nitrogen and one portion of phosphorus should be added to 100 of BOD; however, this should be kept to a minimum to avoid eutrophication. When using a plastic filter packed bed, the waste water is mixed with already treated water and sprayed over the bed. Aerobic bacteria multiply rapidly and eliminate BOD (COD) efficiently. The water is returned to the circulation tank and part of it is discharged. The circulation tank and part of it is discharged. The circulation, treatment water concentration and the filter bed load. With the plastic bed, M3/M2/day is 30-200. In an open aeration tank, a natural ventilation (for oxygen) always takes place because of the different temperatures of the air and water; but in an enclosed air-tight bed, ventilation should be forced by fans. The number of stages for trickling beds depends on the initial cost, maintenance, and the running cost, but usually two or three stages are used. The amount of sludge is very small and its high self-digestion eliminates the necessity for large quantity sludge treatment. (Seigle-FIRL)

FIRST INSTALLATION IN THE WORLD FOR THE STERILIZATION OF SEWAGE BY GAMMA RAYS (PREMIER INSTALLATION DU MONDE POUR L'HYGIENISATION DES

BOUES D'EPURATION AUX RAYONS GAMMA). Gas-Wasser-Abwasser, Vol 54, No 5, p 170-171, May 1974. 1 fig.

Descriptors: *Waste water treatment, Treatment facilities, *Sewage treatment, *Gamma rays, Radioactive wastes, Dewatering, *Water reuse. Identifiers: Munich(Germany), Sewage treatment plants, Sterilization.

A new installation for the sterilization of sewage sludge by gamma rays, developed by Sulzer Company, and installed in the Munich area, West Germany, is described. The batch type sterilizer is composed of an underground, concrete irradiation shaft, and uses Co-60, Cesium-137, and other radioactive wastes from nuclear reactors for irradiation of a predetermined duration. The closed circuit design and the automatic control of the charge and discharge processes guarantee maximum radiation protection. The irradiated sewage sludge, which cannot itself become radioactive, is subsequently dewatered and used as manure on farmlands. (Takacs-FIRL)

THE EFFECT OF CHEMICAL WATER TREAT-MENT TECHNOLOGY ON THE EFFICIENCY OF FILTERS (VLIYANIYE TEKHNOLOGII RE-AGENTNOY OBRABOTKI VODY NA EFFEK-TIVNOST' RABOTY FIL'TROV),

TIVNOST' RABOTY FIL'TROV), N. EFFEA-TIVNOST' RABOTY FIL'TROV), V. F. Nakorchevskaya, and L. A. Kul'skiy. Vodosnabzheniye i Sanitarnaya Tekhnika, No 5, p 16-18, 1974. 1 fig, 2 tab, 5 ref.

Descriptors: *Coagulation, *Flocculation, *Filters, *Pre-treatment, Filtration, *Waste water treatment.

Identifiers: *Chemical treatment, *Aluminum sulfate, *Sand filters, Silicic acid, Filter efficiency.

The effect of aluminum sulfate as a coagulant and activated silicic acid as a flocculant on the efficiency of sand filters was studied. Aluminum sulfate is generally used for pre-treatment of water before filtration. The maximum possible duration of the protective action of the sand filter may exceed the minimum duration by a factor of two to seven. However, the duration of the efficient filter operation decreases with the increase in the contact time between aluminum sulfate and silicic acid. This reaction is due to the increase in the size of the aluminum sulfate floccules with increasing contact time. Therefore, the contact time should not be longer than 10 to 20 seconds. The most durable filtration efficiency is obtained in heterocoagulation or when the flocculant is introduced immediately after the coagulant. (Takacs-FIRL)

METHOD AND APPARATUS FOR TREAT-MENT OF LIQUID WASTES, Nittelsu Chemical Engineering Co. Ltd., Chiyoda (Japan). (assignee)

(Japan). (assignee)
M. Akune, K. Yoshii, and T. Yamauchi.
U.S. Patent No. 3,847,713, 5 p, 2 fig, 17 ref; Official Gazette of the United States Patent Office, Vol 928, No 2, p 716, November 12, 1974.

Descriptors: *Patents, *Liquid wastes, *Waste water treatment, Organic wastes, Gases, Steam, Incineration.
Identifiers: Ash, Scrubbers, Inorganic wastes, Organometallic compounds, *Combustion.

Liquid waste containing a mixture of organic and inorganic materials or organometallic compounds is, in turn, dehydrated, concentrated, combusted and the ash produced therefrom is recovered in the form of an aqueous solution or a slurry. High temperature combustion exhaust gases are injected into water in a recovery vessel and the ash entrained therewith is recovered as an aqueous solutions.

tion or a slurry, and the heat contained in the liquid waste as well as the heat evolved from the auxiliary combusting fuel are recovered in the form of steam which contains non-condensable gases that are utilized in the concentration of additional liquid waste under a reduced pressure. (Sinha-OEIS)
W75-05818

SEWAGE OZONIZING UNIT, Texaco, Inc., New York. (assignee) B. V. Klock, and R. C. White. U.S. Patent No. 3,853,760, 3 p., 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 929, No 2, p 773, December 10, 1974.

Descriptors: *Patents, *Sewage treatment, *Ozone, Pollution abatement, *Waste water treatment, Water pollution control, Sludge. Identifiers: Coking.

A sewage ozonizing unit for the disposal of waste sewage from a small installation includes a primary settling zone receiving the sewage and separating raw sludge from liquid. A first pump conveys the water to a storage zone and actuates an ozonizer supplying ozone through a gas diffuser to the storage zone. A second pump forces the settled sludge to a coking zone where it is coked in the liquid phase. The coke thus formed then passes to a pressure settling device where it is separated from the aqueous coking effluent which is recycled to the storage zone. (Sinha-OEIS)

REMOVING OIL FROM WASTE WATER WITH SULFUR,

Amoco Production Co., Tulsa, Okla. (assignee)
L. W. Jones.
L. S. Start No. 3 952 753 6 p. 650 8 p. 650 1055

U.S. Patent No. 3,853,753, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 929, No 2, p 771, December 10, 1974.

Descriptors: *Patents, *Waste water treatment, *Oil wastes, *Sulfur, Water pollution control, Pollution abatement, Filters, Quality control.

Water containing dispersed oil is caused to flow through a bed of granular sulfur or sulfur coated sand. This presents a surface area of solid phase sulfur to coalesce the dispersed oil. The oil coagulated with sulfur and water is then entered into a cyclone separator where the coagulate is separated from the water. (Sinha-OEIS) W75-05820

PROCESS AND APPARATUS FOR TREATING WASTES BY A COMBINED ACTIVATED SLUDGE AND BIOLOGICAL FILTER BED,

J. Tymoszczuk.
U.S. Patent No. 3,853,752, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 929, No 2, p 770, December 10, 1974.

Descriptors: *Patents, *Waste water treatment, *Filtration, *Aeration, *Biological treatment, *Aerobic treatment, Pollution abatement, Water pollution control, Equipment, Activated sludge.

The process comprises maintaining a submerged biological filter bed zone and an activated sludge zone in upstream fluid flow relationship. Sewage is fed to the activated sludge zone. Both zones are aerated. The filter bed zone is backwashed as often as required to maintain the operating effectiveness and an acceptable head at the point of withdrawal of the treated effluent. An upper layer of the filter media is transported to a conduit positioned in the activated sludge zone. (Sinha-OEIS) W75-05821

LIQUID TREATMENT APPARATUS, Environmental Technology Corp., Bloomington, Minn. (assignee) J. E. Bearden.

U.S. Patent No. 3,852,384, 6 p, 8 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 929, No 1, p 328, December 1974.

Descriptors: *Patents, *Aeration, *Waste water treatment, *Pollution abatement, *Water pollution control, Equipment, Chemical oxygen demand, Biochemical oxygen demand, Bubbles, *Oxidation

Identifiers: Gas bubble generator, Ponding area.

An apparatus is described for efficiently providing aeration of water in a ponding area such as a sewage ponding tank to maintain the oxygen con-tent of the water at a level sufficient to satisfy the biological and chemical oxygen demand. An openended elongated tube is vertically positioned with its lower end above a gas bubble generator so that gas bubbles are entrained in the liquid and carry the liquid and bubbles up through the tube. A plurality of orifices are provided in the tube walls to draw in liquid from the side portions of the tube at a point above the lower end of the tube to increase the efficiency of the aeration. In the preferred form a helical path is provided within the tube to increase further the time of exposure of the gas to the liquid being treated to provide a shearing ac-tion to minimize bubble size. Also disclosed is an automatically adjustable length for the tube to compensate for the rise and fall of pond depth. (Sinha-OEIS) W75-05826

5E. Ultimate Disposal Of Wastes

LIVESTOCK MANURE DISPOSAL. HYDROGASIFICATION,
Kansas Water Resources Research Inst., Manhat-

For primary bibliographic entry see Field 5D. W75-05351

FEASIBILITY STUDIES FOR DECONTAMINA-TION AND DENSIFICATION OF CHOP-LEACH

CLADDING RESIDUES,
Battelle-Pacific Northwest Labs., Richland, Wash.

For primary bibliographic entry see Field 5D. W75-05371

ENVIRONMENTAL MONITORING DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1973, Naval Ship Systems Command, Washington, D.C. Nuclear Propulsion Directorate. For primary bibliographic entry see Field 5B.

CHEMICAL ENGINEERING DIVISION, WASTE MANAGEMENT PROGRAMS, QUARTERLY REPORT, APRILJUNE 1974, Argonne National Lab., Ill.
For primary bibliographic entry see Field 5D.

W75-05383

W75-05376

QUARTERLY PROGRESS REPORT:
RESEARCH AND DEVELOPMENT ACTIVITIES, WASTE FIXATION PROGRAM, APRIL
THROUGH JUNE 1974,
Battelle-Pacific Northwest Labs., Richland,
Wash. Nuclear Waste Technology Dept.
For primary bibliographic entry see Field 5D.

W75-05393

ANIMAL WASTE CONVERSION SYSTEMS BASED ON THERMAL DISCHARGE, Oregon State Univ., Corvallis. Dept. of Soil Science. ry bibliographic entry see Field 5D. W75-05453

DISPOSAL OF HAZARDOUS WASTES, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 5G. W75-05504

TRANSPIRATION DRYING OF SANITARY

LANDFILLS, Auburn Univ., Ala. Dept. of Civil Engineering. F. J. Molz, S. R. Van Fleet, and V. D. Browning. Ground Water, Vol 12, No 6, p 394-397, November-December 1974. 3 fig, 1 tab, 13 ref. OWRT B-048-ALA (1).

Descriptors: *Landfills, *Waste disposal, *Leachate, *Transpiration, *Moisture uptake, Drying, Solid wastes, Ultimate disposal, Environmental engineering, Model studies, Water loss, Monitoring, Water pollution sources, Garbage dumps, Waste dumps, Waste water(Pollution), Sampling, Lysimeters, Movement, Percolation. Identifiers: *Sanitary landfills.

Experiments were described which test the feasibility of diminishing the leachate production of sanitary landfills by using the roots of transpiring plants to dry the refuse and surrounding soil. Fullscale models of landfill cores were constructed and filled with typical municipal refuse in the early spring of 1973. Selected plants species such as slash pine, thorny elaeagnus, bristly locust, black locust, and two grasses were used to vegetate two landfill models, while a third was denied vegetation. The various species of selected plants have thrived, even though the lower two-thirds of the landfill models quickly became anaerobic. Roots proliferated rapidly through the top 2.5 ft of cover soil and first refuse layer. Following December soil and tirst retuse layer. Following December 1973, all three lysimeters began producing leachate. However, the volume of leachate produced differed considerably depending on whether the particular lysimeter was vegetated or fallow. To date, the unvegetated control has produced 17.53 inches while the two vegetated models have produced 8.59 inches and 2.49 inches respectively. The unvegetated bin produced the most dilute leachate. If the chemical oxygen demand, the total Kjeldahl nitrogen, and the total solids are used as indices representative of the potency of leachate, then the leachate from the lysimeter containing pine and thorny elaeagnus was 1.97 times more concentrated than that from the fallow lysimeter. (Sanderson-ISWS) W75-05523

TREATED **EFFLUENT** GOES 'UNDERGROUND', For primary bibliographic entry see Field 5D. W75-05544

PROTESTING POLLUTION. For primary bibliographic entry see Field 5D. W75-05560

SEWAGE SLUDGE CENTRIFUGING GETS SCOTTISH OK. For primary bibliographic entry see Field 5D. W75-05562

MOBILIZATION OF IRON IN WATER IN THE MAGOTHY AQUIFER DURING LONG-TERM RECHARGE WITH TERTIARY-TREATED RECHARGE WITH TERTIARY-TREASEWAGE, BAY PARK, NEW YORK, Geological Survey, Mineola, N.Y. For primary bibliographic entry see Field 5B.

CHEMICAL AND PHYSICAL DATA FOR DISPOSAL WELLS, EASTERN SNAKE RIVER PLAIN, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 5B.
W75-05632

5F. Water Treatment and **Quality Alteration**

SOCIO-ECONOMIC IMPACTS OF RURAL WATER SUPPLIES, University of Southern Mississippi, Hattiesburg. Dept. of Economics. For primary bibliographic entry see Field 6B. W75-05407

DAVIS COUNTY COMPREHENSIVE STUDY: CULINARY WATER, PRESSURE IRRIGATION WATER, SANITARY SEWERAGE. Davis County Planning Commission, Farmington, Iltah. For primary bibliographic entry see Field 3F. W75-05418

COMPREHENSIVE WATER AND SEWER PLAN, BRADLEY COUNTY, TENNESSEE. Sanders (B.G.) and Associates, Inc., Atlanta, Ga. For primary bibliographic entry see Field 6B.

ASBESTOS REMOVAL SYSTEMS PERFECTED, For primary bibliographic entry see Field 5D. W75-05543

NEW WATER WORKS FOR SUTTON. Water and Waste Treatment, Vol 17, No 8, p 46, August, 1974. 1 tab.

Descriptors: Water pollution, Water quality control, *Bacteria, *Chlorination, Reservoirs, Domestic sewage, Boreholes, *Treatment facilities, *Water treatment, *Waste water treatment.

The construction of a new water works at Grander Green Lane, Cheam, Great Britain, is planned by the Sutton District Water Company to guard against bacterial pollution. The process of super chlorination followed by de-chlorination will sterilize the water. A dose of chlorine applied to the water at a borehole head as soon as it has been abstracted from the borehole should prevent any danger of pollution. As it travels through a contact tank, the chlorine will have one hour to destroy organisms present, an the excess chlorine will be removed by a dose of sulphur dioxide. An addition of ammonia will make the remaining chlorine more persistant in the distribution system and service reservoirs in corrosion prevention of plumbing fittings and odor-taste pollution prevention. Chlorine content will be monitored, displayed and content content will be instituted as a supplyed and recorded by a chlorine residual recorder, which automatically adjusts the residual chlorine being pumped into supply. The sterilization system will operate under a 'fail-safe' principle, alerting resident staff to quality control malfunctioning. A 24-hour service will be available for consum problems with domestic plumbing. (Leibowitz-FIRL) W75-05554

EXTENSIONS TO HANNINGFIELD WORKS OF ESSEX WATER COMPANY.
Water Services, Vol 78, No 940, p 190-196, June 1974.6 fig.

Descriptors: Water supply, *Reservoirs, *Water supply development, Facilities, Pipelines, Pumps, Filters, Chemicals, Equipment, Costs, Treatment facilities, *Water treatment, Waste water treat-Identifiers: Great Britain, Water works.

The extensions to the Hanningfield Reservoir, Essex, Great Britain, were opened on May 10, 1974. The present situation, the new works, and future plans are discussed. A schedule of technical data is included. The new extensions include ef-

Group 5F—Water Treatment and Quality Alteration

fluent pipelines, aqueducts, a pilot plant, vertical flow tanks, accelerators, a chemical house, a chemical plant, electrical and control stations, a carbon dioxide generator, gravity filters, pumping stations, filtered water tanks, wash water tanks, and roads and drains. The new works cost approximately four million pounds. (Orr-FIRL) W75-05558

DISINFECTION: THE LAST LINE OF DEFENSE FOR POTABLE WATER, G. C. White.

Water and Sewage Works, Vol 121, No 7, p 66-67, July, 1974.

Descriptors: Water pollution, Water quality, Management, *Disinfection, *Water purification, *Chlorination, Nitrogen compounds, *Waste water treatment, Coliforms, Potable water, *Water treatment.

Identifiers: Free residual process, Ammonia nitrogen, Organic nitrogen, N-chloro compounds.

The Community Water System survey revealed that 77 percent of water treatment plant operators dequately trained in elementary microbiology, with 46 percent deficient in chemistry relating to the operation of the facility. A review of the important aspects of chlorination chemistry was presented. In the free residual process, free chlorine displays the most powerful germicidal ability of all chlorine compounds, with the exception of chlorine dioxide. This process should be operated so that the HOCl content of the final residual is 85 to 90 percent of the total residual. Ammonia nitrogen and organic nitrogen cause the most interference with the process. Ammonia nitrogen may be removed by chlorine easily, requiring approximately 10 parts of chlorine for each part of ammonia. Organic nitrogen compounds can produce a system of unstable residuals, with reactions lasting for days before completion, often resulting in N-chloro com-pounds with taste and odor problems in the distribution system. The coliform concentration is a salient factor in the evaluation of raw water quality. At Lake Tahoe, California, a plant produces effluent with a coliform concentration less than 2.3/100 ml. This potable standard is achieved with chlorine doses of 2 to 3 mg/liter in the presence of to 15 mg/liter of ammonia nitrogen. (Leibowitz-FIRL) W75-05564

4632 TDS REDUCED TO 322 BY REVERSE OS-MOSIS.

For primary bibliographic entry see Field 5D. W75-05566

ACID MINE DRAINAGE WATER MADE FIT TO DRINK.

For primary bibliographic entry see Field 5D. W75-05688

ASSESSING THE CAPABILITY OF THE EVER-GLADES MARSH ENVIRONMENT FOR RENOVATING WASTEWATER, Agricultural Research Service, Fort Lauderdale,

For primary bibliographic entry see Field 5D. W75-05743

5G. Water Quality Control

CHLORIDES IN LAKE ERIE BASIN, State Univ. of New York, Buffalo. Dept. of Civil Engineering. For primary bibliographic entry see Field 5B. W75.03555 COMPATIBILITY OF HAFNALLOYS 105 AND 150 WITH 238PUO2, Los Alamos Scientific Lab., N.M.

Los Alamos Scientific Lab., N.M. For primary bibliographic entry see Field 5A. W75-05363

SHIPPING CONTAINER FOR PLUTONIUM-238 AS FISSILE MATERIAL CLASS 1, Los Alamos Scientific Lab., N.M.

H. E. Noyes. Available from the National Technical Information Service, Springfield, Va. 22161, as REPT. No. LA-589-MS, \$4.00 in paper copy, \$2.25 in microfiche. Report LA-5589-MS, May 1974. 40 p, 2 fig, 1 tab, 4 append.

Descriptors: *Plutonium, *Transportation, *Water pollution sources, *Storage tanks, *Stability, *Porosity, Safety, Design criteria, Leakage, Penetration.

The stainless steel shipping container is a small, right cylindrical assembly approximately 46 cm in diameter and 50 cm high, weighing approximately 91 kg. Access to the inner container is through a series of bolted flanges. The source material within the inner cavity must be doubly encapsulated. The contents must not exceed 720 g plutonium (oxide or metal), or be so reduced in quantity so as to not exceed the legally applicable external radiation limits at contact and at 1 m. The dual container is designed to preclude leakage of any water into the inner container. (Houser-ORNL) W75-05364

ASSESSING AND CONTROLLING THE HAZARD FROM TRITIATED WATER, Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.

Available from the National Technical Information Service, Springfield, Va. 22161, as REPT. No. AECL-4150, \$5.45 in paper copy, \$2.25 in microfiche. Report AECL-4150, April 1970. 98 p, 14 fig, 7 tab, 53 ref.

Descriptors: Assessment, *Assay, *Tritium, *Water vapor, *Nuclear powerplants, *Reactors, *Radioactivity, Nuclear wastes, Hazards, Safety, Evaluation, Absorption, Human population, Public health. Identifiers: *Tritiated water.

Practical and theoretical information is presented to help radiation surveyors and operators of heavy-water reactors, etc. to understand, assess and control the radiation hazard from tritiated water (HTO or DTO). The intake of HTO through the skin and lungs, its excretion and the associated radiation dose are discussed, and concepts such as critical organ, dose commitment, maximum permissible concentration in air (MPC) a and (MPC) a-hour are explained. Methods of controlling the hazards from tritiated water are discussed: HTO detection in air and urine; ventilation and containment for limiting HTO concentrations in working areas; air-supplied respirators for preventing inhalation of HTO vapor; and protective clothing, barrier creams and washing after exposure to minimize reduction of dose commitment by increasing water intake are explained also. (Houser-ORNIL)

USES OF POWER PLANT DISCHARGE WATER IN GREENHOUSE PRODUCTION, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.

Div. of Agricultural Development. For primary bibliographic entry see Field 3C. W75-05380

FEASIBILITY AND ALTERNATE PROCEDURES FOR DECONTAMINATION

AND POST TREATMENT MANAGEMENT OF PU-CONTAMINATED AREAS IN NEVADA, California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology. A. Wallace, and E. M. Romney.

A. Wallace, and E. M. Romney.
Available from NTIS, Springfield Va. as REPT.
No. UCLA12-973. \$5.45 in papery copy, \$2.25 in
microfiche. Report UCLA12-973, September 1974.
90 p. 17 fig, 12 tab, 122 ref. AEC AT(04-1) GEN12

Descriptors: *Plutonium, *Soil contamination, *Accidents, *Nuclear explosions, Fallout, Air pollution, Water pollution, Deep tillage, Irrigation, Land development, Arid lands, Revegetation, Ecology, Ecosystems, Nevada, Feasibility studies.

Identifiers: Weapons testing.
*Decontamination(Soil), *Nevada AEC Test Site.

This report was prepared in response to needs for determining the feasibility and environmental impact of cleaning up Pu-contaminated areas in Nevada. Instead of considering all aspects of radioactive decontamination, it deals primarily with findings from pertinent land area decontamination and post-management experiences which can be applied to solving Pu problems at the Nevada Test Site and the Tonopah Test Range. Previous experiences from accidental and planned releases of Pu in the environment are discussed along with those gained from nuclear fallout decontamination studies. Alternate procedures are discussed which may be useful in Nevada, providing the necessary experimental work is done to test the validity of the assumptions made. Many answers to pertinent questions can be obtained from investigations conducted outside of the Pu area. Recommendations are made for experimental work that should be done to determine the best course of action before cleanup begins. (Houser-ORNL.)

NUTIS: NUMERICAL AND TEXTUAL INFOR-MATION SYSTEM, VERSION 1.0, - A USERS MANUAL,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 7C. W75-05390

MEASURING THE SOCIAL ATTITUDES AND AESTHETIC AND ECONOMIC CONSIDERATIONS WHICH INFLUENCE TRANSMISSION LINE ROUTING,
Battelle-Pacific Northwest Labs., Richland,

For primary bibliographic entry see Field 6G. W75-05391

Wash.

REDUCTION OF ATMOSPHERIC POLLUTION BY THE APPLICATION OF FLUIDIZED-BED COMBUSTION: ANNUAL REPORT, JULY, 1972-JUNE, 1973, Argonne National Lab., Ill.

For primary bibliographic entry see Field 5D. W75-05392

NUCLEAR POWER FACILITY PER-FORMANCE CHARACTERISTICS FOR MAK-ING ENVIRONMENTAL IMPACT ASSESS-MENTS.
Directorate of Regulatory Standards (AEC),

Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-05395

TELEMETRY IN WATER POLLUTION CONTROL, South Yorkshire Metropolitan Country Council (England). For primary bibliographic entry see Field 5D. W75-03397

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

PROTECTION OF THE ENVIRONMENT FROM CONTAMINATION WITH PESTICIDES USED IN COTTON GROWING, (IN RUSSIAN), V. K. Khasanov.

V. N. Anasamo; Gig Sanit. 38(3): 107-108, 1973. Identifiers: *Cotton, Environmental protection, Fruit, *Pesticide residues, Pollution, Protection, USSR, Water pollution, Irrigation channels.

A study of environmental residues of pesticides used in cotton-growing, including or-ganophosphorus compounds, led to a reduction in the use of aerial application in 1970-1971 (USSR). In the Khorezm region, levels of these pesticides in irrigation channels decreased 44.3% in 1970 and 31.2% in 1971. Residues in fruits also decreased significantly.--Copyright 1974, Biological Abstracts, Inc. W75-05408

INTERIM WATER QUALITY PLAN FOR THE MINNEHAHA COUNTY STANDARD METROPOLITAN STATISTICAL AREA AND DISTRICT IL

South Eastern Council of Governments, Sioux For primary bibliographic entry see Field 6B. W75-05421

CAREFUL RENEWAL OF A CAMPUS LOCH, Sheffield Univ. (England). A. E. Weddle.

Landscape Architecture, Vol 64, No 5, p 406-409, October 1974. 3 fig.

Descriptors: *Limnology, *Lake morphology, *Lake morphometry, *Ecology, *Reclaimed water, Entrophication, Lakes, Silting, Environmental control, Water conservation, Land development, Foreign projects, Dredging. Identifiers: *Edinburgh(Scotland).

description is given of the restoration of a Loch (Lake) at Riccarton, an old county estate which is the site of the new Heriot-Watt University, Edinburgh, Scotland. The unversity assigned to the landscape consultants the task of keeping the site, or parts of it at least, as 'natural' or undisturbed as possible. The consultants, realizing a policy of preservation or restriction would not suffice, set out to build a new landscape, focusing on a go preservation whereever possible. This report deals with the renewal of the Loch and its associated water courses. Before redevelopment the Loch was shallow and seriosly silted at its near-stagnant western end where mud banks had formed. Being almost entirely overhung by trees and shrubs, marginal vegetation was largely restricted to the in-flow stream and neighborhood of the dam. After development, the vegetation of the Loch had clearly undergone wide-spread simplification. The reduced from 16 species to a trace of just three, and the water bistort was also gone. Small amounts of ten species of aquatic vegetation had returned. Some planting is recommended to complement the background of native plants. There is exidence that describe altered the accounter of prement the background of native plants. There is evidence that dredging altered the ecosystem of the lake and produced great fluctuations in number and type of species. This is expected to attain an equilibrium soon. (Poertner)
W75-05426

JOINING FORCES TO SAVE DAMAGED LAKES IN SWEDEN AND TUNISIA, Lund Univ. (Sweden).

S. Bjork.

Landscape Architecture, Vol 64, No 5, p 396-405, October 1974. 11 fig.

Descriptors: *Lake morphometry, *Limnology, *Lake morphology, *Reclaimed water, *Water reuse, Reclaimed water, Water pollution control, Water conservation, Water quality control, Foreign projects, Entrophication, Lakes, Environmental control, Ecology, Hypolimnion.

Identifiers: *Lake restoration, Sweden, Tunisia.

Descriptions are given of four lake restoration projects, three in Sweden and one in Tunisia, that prove the need for cooperative efforts between public administrators, politicians and technicians. The four projects were undertaken by a team of limnologists at the University of Lund in Sweden as part of a lake restoration program that has been going on for several years. The lakes investigated in this program represent a wide variety of condi-tions. Thus, three different sets of methods had to be worked out to correct the balance of the three different lake ecosystems. This meant that, among other things, the equilibrium between production and mineralization had to be restored. The aims of the University's lake restoration program are to: develop methods of solving man-made environ-mental problems, restore lakes judged to be of high environmental value, train limnologists, and contribute additional knowledge to theroretical ecology. About twenty university researchers have been active in this project. (Poertner) W75-05428

CONNECTICUT WATER LAW: SUMMARY AND INDEX OF STATUTES,
Connecticut Univ., Storrs. Inst. of Water Resources. For primary bibliographic entry see Field 6E. W75-05437

ALTERNATIVE METHODS OF EVALUATING THE ECONOMIC AND SOCIAL ASPECTS OF WATER QUALITY,

Rutgers - the State Univ., New Brunswick, N.J. Dept. of Economics. V. D. Polhemus.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 026, \$7.50 in paper copy, \$2.25 in microfiche. M.A. Thesis, January, 1974, 231 p. OWRT A-014-NJ(5).

Descriptors: *Environmental effects, *Evaluation, Benefitt, Environment, Measurement, Analytical techniques, Fishing, Recreation, *Water quality, *Market value, Econometrics, *Intangible benefits, *Alternative costs. Identifiers: Subjective techniques.

Within the decision making process which justifies or rejects programs to restore environmental quality, there is implicit a system of measurement. Described are the problem of deteriorating water quality and the need for a reliable, uniform evaluation system within the existing framework of a tion system within the existing framework of a free market where personar freedoms are con-tinually being eroded by increasing overnment ac-tivity. Presented are techniques of dollar value, index and group measurement which have bee ac-cepted in the past or are currently proposed in the literature. Of all the possible evaluation techniques reviewed, not one was free of criticism; however, monetary techniques reflecting market values were least objectionable.

NEUTRALIZATION OF ACIDIC WASTES BY CRUSHED LIMESTONE: EVALUATION OF PROTOTYPE CRUSHED LIMESTONE BARRIERS FOR THE NEUTRALIZATION OF ACIDIC STREAMS, Pennsylvania State Univ., University Park. Dept. of Civil Expinaction.

of Civil Engineering.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 111, \$8.50 in paper copy; \$2.25 in microfiche. Ph.D. Thesis, 247 p, June 1974. 72 fig, 55 tab, 60 ref, 16 append. OWRT A-030-PA(3). 14-31-0001-3838.

Descriptors: *Limestone, *Neutralization, *Acidic wastes, Kinetics, Chemical reactions, Thermodynamics, Hydraulics, *Mathematical models, Waste water treatment.

Identifiers: *Reagents, Physical boundary.

Crushed limestone is usually the cheapest reagent for the neutralization of acidic wastes. For the ra-tional design of limestone neutralization processes, an evaluation is needed of the kinetics of the chemical reactions involved, coupled with an analysis of chemical and physical boundary conditions that control the extent to which the reactions are completed. Chemical kinetics are evaluated by observation of a chemical system in which the reactions of concern occur. Chemical boundaries are established by the thermodynamics of the reactions. Physical boundaries, such as the time and surface area of contact between the reactants, are evaluated by application of the laws of hydraulics to the geometry and hydraulics of the system. The kinetics of the rate-limiting chemical reactions that occur when limestone is exposed to acidic water were evaluated by experiment over a rather wide range of conditions. Equations governing the system were assembled into a mathemati-cal model, which describes the progress of the neutralization process under specified conditions. The model was applied to predict the performance of a number of barriers of crushed limestone, that had been constructed in acidic streams to alleviate acid-pollution. Field measurements were taken and samples of water from the barriers were analyzed to determine barrier performance. Based on the comparison between predicted and observed performance of the prototypes, a simple procedure was derived for the design of limestone barriers. W75-05454

SELECTIVE WITHDRAWAL AT AN INTER-MEDIATE DEPTH FROM A DENSITY STRATIFIED IMPOUNDMENT,

Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.

G. R. Clark

Available from the National Technical Informa iton Service, Springfield, Va 22161 as PB-240 016, \$5.75 in paper copy, \$2.25 in microfiche. M.S. In-dependent Study Report, June 1974. 118 p, 16 fig, 3 tab, 16 ref, 3 append. OWRT B-080-WIS(4). 14-31-0001-3948

Descriptors: Hydraulics, *Impoundments, Flow, *Destratification, *Thermal stratification, *Water quality control, Model studies, *Withdrawal, Reservoirs, Hypolimnion. Identifiers: *Selective withdrawal.

A variety of methods have been proposed to improve the water quality of lakes and reservoirs. The overall improvement of water quality in a reservoir through the removal of the poor quality, hypolimnetic water is described. In particular, theoretical and experimental investigations on selective withdrawal of a viscous, non-diffusive, linearly-stratified fluid from the bottom of a reserwe been carried out. The governing differential equations which describe planar and axisymmetric withdrawal are derived. In each case, an assumed horizontal velocity profile is substituted into the integral form of the momentum equation; the resulting ordinary differential equation is solved numerically to give the variation with distance from the outlet of the thickness of the layer of hypolimnetic water withdrawn. Using the assumed velocity profile and the principle of mass conservation, expressions are derived in each case to predict the quality of the water withdrawn. Laboratory experiments are conducted; the results obtained verify the theoretical predictions. predictions. Procedures for predicting the withdrawal layer thickness and discharged water quality in an actual reservoir are discussed. (Ho-Wisconsin) W75-05456

SOME POLLUTION-RELATED ATTITUDES OF HIGH SCHOOL YOUTH IN THE UNITED STATES AND BRAZIL, Illinois Univ., Urbana, Dept. of Sociology.

Group 5G-Water Quality Control

Available from the National Technical Informa-Avanable, from the National Feetineal information Service, Springfield, Va 22161 as PB-240 156, \$7.50 in paper copy; \$2.25 in microfiche. PhD Thesis, 1973. 218 p, 30 tab, 8 fig, 7 append, 29 ref. OWRT B-052-ILL(2). 14-31-0001-3275.

Descriptors: *Attitudes, *Social values, United States, *Social change, *Illinois, Surveys, Water pollution, Social aspects, Measurement. Identifiers: Youth, Pollution issues, Federal intervention. *Brazil.

Attitudes toward pollution issues, and the potential for change in such attitudes were investigated. Data were obtained from high school seniors in a small Illinois town which was attempting to solve a severe water pollution problem. Students' tion attitudes were measured in a bench-mark sur-vey. They were exposed to a speech against Federal intervention in local pollution issues and resurveyed. As expected, attitudes shifted toward opposition to Federal intervention. However, alysis of variance indicated that students who ranked themselves as independent and able to predict events in their lives (who were least alienated) were least influenced by the speech. It was con-cluded that there seem to be levels of attitudes, from basic world views to issue-specific attitudes, such as those on pollution. Changes in issue-specific attitudes seem to be related to an infrastructure of more general, diffuse attitudes. Though the entire study was not replicated in Brazil, the results generally support the conclusions based on U.S. data W75-05461

TOWARD A TECHNIQUE FOR QUANTIFYING AESTHETIC QUALITY OF WATER RESOURCES.

Utah State Univ., Logan. For primary bibliographic entry see Field 6A. W75-05473

QUANTIFYING AESTHETIC OPPORTUNITY, Arizona Univ., Tucson. For primary bibliographic entry see Field 6A. W75-05476

EVALUATION OF QUALITY PARAMETERS IN WATER RESOURCE PLANNING (A STATE-OF-THE-ART SURVEY OF THE ECONOMICS OF

WATER QUALITY), IWR Contract Report 74-13, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, December 1974. 250 p. 1 fig. 56 tab. 199 ref.

Descriptors: *Water quality, *Surveys, *Evaluation, *Water resources, *Water purification, *Benefits, *Costs, Technology, Planning, Water supply, Optimization, Surface waters, Groundwater, Water treatment, Wastes, Recycling, Water allocation(Policy), Methodology, Model studies, Equations, Reservoirs, Hydrology, Standards, Systems analysis. ment. Instream use.

Presented is a report intended to provide the Corps of Engineers and other planners with a summary and critique of the literature considering the economics of water quality and a synopsis of relevant methodology which relates water quantity to water quality. Economic cost and benefit calculations are estressed along with optimizing procedures. Water quality is reviewed from the standpoint of: determining the influence of water contaminants on various uses of water; water quality indices and standards; water quality models; sechnology and cost of water supply purification and of waste and receiving-water purification; benefits derived from enhanced water quality; economic techniques for optimal water supply purification and allocation; and economic techniques for optimal waste and recycling water purification. (Bell-Cornell) models; technology and cost of water supply pu

LIME RETENTION IN ANTHRACITE COAL-BREAKER REFUSE

Forest Service (USDA), Kingston, Pa. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 4D.
W75-05496

DISPOSAL OF HAZARDOUS WASTES,

Geological Survey, Denver, Colo. Water Well Journal, Vol 28, No 10, p 43-45, October, 1974.

Descriptors: *Waste disposal, *Legal aspects, Management, Radioactive wastes, Industrial wastes, Radioactive waste disposal, Landfill, Waste disposal wells, Waste disposal.

The United States Environmental Protection Agency comprehensive report to Congress in 1973 on storage and disposal of hazardous wastes is reviewed. This report points out that: (1) the magnitude of the hazardous waste problem was greater than originally anticipated, (2) current management practices for treating, storing or disposing of hazardous wastes do not provide the necessary reassurances that man or the environment are being adequately protected. The Environmental peng adequatery protected. The Environmental Protection Agency presented eleven key findings and one recommendation to Congress. The Environmental Protection Agency also proposed a Hazardous Waste Management Act, which later was introduced to Congress as Senate Bill S1086 and House Bill HR4873 by Senator Baker and Representatives Staggers and Devine. Some of the provisions of this act are listed. (Bradbeer-NWWA) W75-05504

AQUIFER CLOGGING IN COMBINED WASTE-WATER RECHARGE,

Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.

For primary bibliographic entry see Field 5D. W75-05520

METER FOR SEWER FLOW MEASUREMENT. Illinois Univ., Urbana. Dept. of Civil Engineering.

Hindos Only, Oroana. Dept. of Civi Engineering.
H. G. Wenzel, Jr.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 101, No HY1,
Proceedings Paper 11070, p 115-133, January 1975.
11 fig, 3 tab, 17 ref, 2 append. OWRT B-063-ILL

Descriptors: *Discharge measurement, *Flow measurement, *Water measurement, measurement, *Water measurement, *Flowmeters, Venturi meters, Pipe flow, Sewers, Drainage, Hydraulics, Urbanization

An experimental and analytical study was per-formed to develop the geometry for a Venturi type The meter consists of a constriction in the pipe which produces critical flow under open channel which produces crucial now induce open chaining flow conditions and acts as a conventional Venturi meter under full flow conditions. The constriction is constructed by using cylindrical segments the diameter of which are larger than that of the pipe, leaving the invert and crown clear. Head loss characteristics and experimental rating curves for both open channel and full flow conditions were described. Information was also presented to permit the selection of geometrical parameters for op-timum performance for a specific installation. (Jess-ISWS) W75-05522

THE RELATIONSHIP OF ELECTRIC POWER STATION THERMAL CIRCULATION TO BIOLOGICAL PRODUCTIVITY: PHASE II -CONTROL OF THERMAL POLLUTION BY BIOLOGICAL SYSTEMS,
Baylor Univ., Waco, Tex. Inst. of Environmental

For primary bibliographic entry see Field 5C. W75-05533

A GENERIC METHODOLOGY TO FORECAST BENEFITS FROM URBAN WATER RESOURCE IMPROVEMENT PROJECTS

Dornbusch (David M.) and Co., Inc., San Francisco, Calif.

For primary bibliographic entry see Field 6B. W75-05536

MULTIPLICATION OF ALGAE IN SEWAGE WATER

Tamil Nadu Agricultural Univ., Coimbatore, (India)

P. Vidhyasekaran, M. Deiveekasundaram, K. Balaraman, and G. Rangaswami. Indian Journal of Agricultural Science, Vol 43, No 5, p 504-506, May, 1973. 2 tab, 7 ref.

Descriptors: *Algae, *Sewage, Water reuse, *Waste water(Pollution), *Proteins, *Nitrogen. Identifiers: Nitrogen sources, *Poultry feed.

Algae which might be used for poultry feed were found to grow well in sewage water with an added nitrogen source. Various nitrogen sources widely altered the protein content of the algae, and groundnut-cake was found to markedly increase the protein content of the algae, and to provide maximum yield of algal dry matter and higher algal nitrogen. (Sandoski-FIRL) W75-05539

WATER QUALITY ANALYSIS SYSTEM WITH MULTICIRCUIT SINGLE SHELL HEAT EXCHANGER,

Beckman Instruments, Inc., Fullerton, Calif. For primary bibliographic entry see Field 5A. W75-05549

A CLOSE LOOK AT LONDON'S WATERS Surveyor, Vol 143, No 4278, p 39, June 7, 1974.

Descriptors: *Water pollution, *Water quality control, *Filtration techniques, *Effluents, *Industrial Reservoirs, Chlorophyll, Phenols, Biodegradation. Identifiers: *Slow sand filtration, Meta Cresol, Particulate carbons, Ammoniacal nitrogen

The Metropolitan Water Board was established as one of the first public bodies of its type in Great Britain to appraise water quality matters there. The MWB established a Water Examination Department in 1905 which for years has produced a reused water supply from water containing inreused water supply from water containing in-creased proportions of purified sewage and trade effluent, of a safe quality and sufficient supply. The supply has been derived from the Thame and Lee Valleys, comprising such industrial areas as Luton, Oxford, Swindon and Stevenage. MWB originated many studies and new techniques based on an interest in water bacteriology. Slow sand fil-tration experiments showed how filters might be run at up to 12 m/day without effluent quality deterioration; this doubled the rate of previous practice. An assessment of the amount of removal of phenols by slow sand filters was made, resulting in the conclusion that to remove doses of one mg/liter, a five day acclimatization is necessary. Phenol at 0.5 mg/liter was removed on the first day, and 0.2 mg/liter with Meta Cresol. In a five day acclimatization about 7.5 mg/liter of the five phenols tested was removed. Experimentation was initiated in the treatment of water with ozone or chlorine before filtration; this treatment increased degradability of organic chemical bacteria. (Leibowitz-FIRL) W75-05550

DEVELOPING WATER SAMPLING STAN-

For primary bibliographic entry see Field 5A.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

W75-05555

REMOVAL OF CATIONS FROM LEACHATE
BY INTERACTION WITH SUBSURFACE

nmental Protection Agency, Boston, Mass. Solid Waste Management Branch. I. W. Leighton, and F. C. Blane.

Journal of the Boston Society of Civil Engineers, Vol 60, No 4, p 145-162, October, 1973. 6 tab, 9 fig.

Descriptors: *Cations, *Leachate, *Infiltration, *Landfills, Sodium, Potassium, Calcium, Iron, Magnesium, Laboratory tests, On-site data collections, Adsorption, Ion exchange, Analytical techniques, Spectroscopy, Soils, Metals, Water

This investigation was conducted in order to determine the magnitude of cation removal from leachate provided by soils under a landfill. The interaction of sodium, potassium, calcium, iron and magnesium cations in leachate with a soil was examined for eight Massachusetts soils in laboratory soil column experiments. Removal capacities for the various soil types were developed based on the soil column experiments. The removal values ranged from 3.8 milliequivalents to 31.1 milliequivalents per 100 grams of dry soil. Shaker tests were used to verify the soil column experi-ments. (Jernigan-Vanderbilt) W75-05589

PERFORMANCE OF RED PINE AND JAPANESE LARCH PLANTED ON ANTHRACITE COAL-BREAKER REFUSE, Forest Service (USDA), Kingston, Pa. Northeastern Forest Experiment Station. For primary bibliographic entry see Field 4D. W75-05597

PUBLIC PERCEPTIONS OF WATER QUALITY IN A METROPOLITAN AREA, Georgia Inst. of Tech., Atlanta. School of Industri-al and Systems Engineering. W. W. Hines, and G. E. Willeke.

Water Resources Bulletin, Vol 10, No 4, p 745-755, August, 1974. 14 tab, 3 ref. OWRT-A-023-

Descriptors: *Water quality, *Psychological aspects, Water law, *Water pollution, Water resources, Water utilization, *Attitudes, Manageresources, Water utilization, "Attitudes, Management, Public health, "Georgia, Water treatment, Water conservation, Water policy, Water management, Water costs, Social aspects, Water requirements, Industrial, Industrial water, Municipal water, Industrial waters, Municipal water, Industrial waters, Municipal waters, Identifiers: "Public perception, "Atlanta(Ga), DeKalb Co(Ga), Fulton Co(Ga), Mass media, Public education, Metropolitan wastes.

A study of public perception of water quality problems in metropolitan Atlanta, Georgia, showed that 2/3 of the population considers these problems serious or critical, and 56% thought they were worsening. Present law was considered too weak by 58%, and a stronger enforcement role was favored for the state by 3/4 of the sample. Three-fourths of the population also favored increased expenditures for improved treatment facilities, and both industries and municipalities were considered to be major contributors to water pollution. Findings clearly show the importance of timely dissemination of accurate information about water quality to the public. Television and about water quality to the public. Television and newspapers appear to be the most important media, with supplementary field trips and familiarization tours. Study population consisted of 1600 households in Fulton and DeKalb Counties, Georgia. A cluster sampling design with two stages of stratification, county and census tract, was employed. Perceptual differences between the counties were not large, nor for income, race, and sex comparisons. The varying experiences of respondents, however, had a large effect on their appraisal of the water quality situation. (Grden-North Carolina)

AUTOMATIC CONTROL OF LARGE-SCALE COMBINED SEWER SYSTEMS, Colorado State Univ., Fort Collins. Dept. of Civil For primary bibliographic entry see Field 5D. W75-05608

COMBINING ESTIMATES OF LOW-FLOW CHARACTERISTICS OF STREAMS IN MAS-SACHUSETTS AND RHODE ISLAND, Geological Survey, Boston, Mass. For primary bibliographic entry see Field 2E. W75-05629

THE DETECTION AND STUDY OF NITRIFICA-TION IN STREAMS AND ESTUARIES, Rutgers-the State Univ., New Brunswick, N.J. Dept. of Environmental Services.
For primary bibliographic entry see Field 5A.
W75-05659

PHOTOSYNTHETIC REAERATION IN THE UPPER PASSAIC RIVER, Rutgers - the State Univ., New Brunswick, N.J. Dept. of Environmental Sciences. For primary bibliographic entry see Field 5B. W75-05662

WATER QUALITY IN THE GREAT LAKES: A NEW TIMETABLE, P. S. Ward.

Journal, Water Pollution Control Federation, Vol. 46, No 8, p 1842-1845, August, 1974. 1 fig.

Descriptors: *Great Lakes, *Water quality control, *Federal government, Legal aspects, Iron, Phosphorus, Mercury, Heavy metals, Toxicity, Contaminants, Organic matter, Coliforms.

The problems encountered by the International Joint Commission (IJC) in its efforts to attain its water quality improvement goals were discussed.
The Great Lakes Water Quality Agreement was signed in 1972 as a result of IJC recommendations.
The agreement outlined both general and specific water quality objectives to be obtained or in progress by 1975. Recommended concentration levels were established for coliforms, dissolved oxygen, total dissolved solids, taste and color, pH, iron, phosphorus, and radioactivity. Interim objectives were designated for temperature, mercury and other toxic metals, and persistent organic con-taminants. A recent report indicated that the IJC will not meet its objectives in the anticipated time frame, mainly because of U.S. bureaucratic complexity and presidential impoundment of water pollution funds. Meanwhile some progress has been made in improving the Great Lakes. Phosphorus loading to all the Great Lakes except Erie have been lowered by the reduction of phosphorus in detergents. Selected water works along the Ohio shore of Lake Erie reported reductions in phytoplankton and total coliform bacteria, and DDT levels in Lake Michigan continued to decline. (Jernigan-Vanderbilt) W75-05694

OPTIMAL ALLOCATION OF WATER QUALITY CONTROLS IN URBANIZING RIVER BASINS, Colorado State Univ., Fort Collins. Dept. of

Agricultural Engineering. W. R. Walker, G. V. Skogerboe, and T. L.

W. R. Walker, S. H. Huntzinger.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 299, \$3.75 in paper copy, \$2.25 in microfiche. Paper

presented at the Ninth American Water Resources Conference, Olympic Hotel, Seattle, Washington. October 21-26, 1973. 25 p, 10 fig, 7 tab, 13 ref. OWRT B-083-COLO(7).

Descriptors: Irrigation water, Municipal water, *Optimization, Salinity, *Water quality control, Waste water treatment, Water quality standards, River basins, *Urbanization, *Utah, Model stu-dies, *Optimum development plans, *Water utilization, Cities. Identifiers: *Utah Lake area(Utah).

Urbanizing river basins in the west are encountering serious water quality degradation resulting from the expanded water utilization. In order to avoid aggravating such conditions, water quality controls need to be implemented. The important questions are, therefore, where and how to impose such constraints on the urban and agricultural sectors to achieve the desired level of pollution con trol. An application of the model developed to address such questions is made in the Utah Lake drainage area of Central Utah as a test of the model's utility. The region is subdivided into five major sub-basins containing both municipal and agricultural water demands. A submodel of each subbasin is developed which optimizes the water quality control strategies by linking the urban to the agricultural uses and then evaluating the levels of control for each sector. From these results, a cost-effectiveness function for each sub-basin is generated. By jointly considering the cost-effectiveness relationship for each sub-basin, an op-timum policy for the entire basin is determined. W75-05774

REGIONAL WASTEWATER MANAGEMENT: A WATER QUALITY EVALUATION OF SYSTEM CENTRALIZATION,

Northwestern Univ., Evanston, Ill. Dept. of Civil For primary bibliographic entry see Field 5D. W75-05775

ESTUARIAL AND COASTAL POLLUTION, For primary bibliographic entry see Field 5B. W75-05811

BOAT FOR COLLECTING OIL SLICKS AND OTHER CONTAMINANTS FROM THE SUR-FACE OF WATER,

D. J. Weatherford. U.S. Patent No. 3,862,904, 7 p, 7 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 930, No 4, p 1875, January 28, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water pollution control, Boats, Flotsam, Skimming, Barges, Equipment. Identifiers: Debris.

A new oil collection craft is a maneuverable, selfpropelled barge equipped with a front-end surface skimmer to which surface films of oil and or other contaminants are drawn by means of a floating boom. The floating boom in the form of a large loop or noose, as it is drawn inward, confines the circumscribed film to an even smaller area of incircumscribed film to an even smaller area of increasingly heavy film until it is swept into the vessel at the skimmer aperture. A heavy wire mesh basket shields the skimmer aperture, collects floating debris, brush and other solid waste materials, and is lifted upward and emptied into a grinder and compressor apparatus which transforms such debris into compacted bales for subsequent disposal. The collected oil and other liquid contaminants are numerically into a floating technique. aisposal. The collected oil and other liquid con-taminants are pumped into a floating storage bag which is towed behind the barge. Pumping equip-ment utilized for the pumping of oil to the storage bag also may be employed to pump water and other fire-fighting chemicals to water cannons and spraying ports for use in fighting fires. (Sinha-OEIS) W75-05816

Group 5G-Water Quality Control

FLEXIBLE OIL BOOM.

R. A. Fossberg. U.S. Patent No. 3,852,978, 4 p, 7 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 929, No 2, p 534, December 10, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution. Pollution abatement, Water quality control, Water pollution control, Barriers, Waves(Water), Equipment, Separation techniques, Floats. Identifiers: Wave action, *Booms

A flexible oil boom is produced comprising a barrier wall of flexible sheet material having an upper portion and a lower portion. These are joined together by an overlapping connection at a loca-tion below the water line. At spaced locations along the length of the barrier wall are a series of vertical pockets, each containing a stiffening rod for holding the boom in a vertically upright posi-tion. Flexible straps are mounted in the overlapping connection such that each strap surrounds the lower edge of the upper portion and is sewn into the overlapping connection. Free ends of the strap extend outward from each side of the barrier wall for connecting floats. Each strap is sewn into the overlapping connection as close as is possible to each stiffening rod pocket. Individual weights are attached to the barrier wall at the lower end of each stiffener rod pocket. When the boom is deployed in a body of water, an individual float is attached to each strap end so that a pair of op-posed floats are associated with each stiffening rod. This pair of opposed floats at the water line and the weights at the lower end tend to maintain each stiffening rod in a substantially vertical position. The barrier wall between the stiffening rods is quite flexible and can flex both horizontally and vertically. In choppy wave action the boom is able to ride the waves because the portion of the barrier wall in the region of each stiffening rod is able to rise and fall with choppy waves without affecting more remote portions of the boom. (Sinha-OEIS)

FLOATING ANTI-POLLUTION DEVICE, Kleber-Colombessa, Paris (France). (assignee)
L. Ballu.

U.S. Patent No. 3,852,964, 4 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 929, No 2, p 530, December 10, 1974.

Descriptors: *Patents, *Flotsam, *Barriers, Water pollution control, Water quality control, *Pollution abatement, *Floats.

The barrage or barrier consists of a skirt provided with ballast and supported by floats. In order to adapt each portion of the barrage to the conditions into which it is placed, the corresponding skirt may be raised so as to modify its height. Straps connect the bottom of the skirt with the upper portion of the float. The two ends of the straps are tied together by loops placed along one of the end portions of the strap so that the strap is rendered endless, each strap passing underneath the ballast of the skirt. When lengthening or shortening the strap with the aid of adjacent loops, the ballast is lifted or lowered corresponding to a decrease or increase of the height of the skirt. (Sinha-OEIS) W75-05825

NEW PRIORITIES FOR GROUND-WATER QUALITY PROTECTION,
Geraghty and Miller, Port Washington, N.Y.
For primary bibliographic entry see Field 5B.

W75-05827

SOIL AND GROUND-WATER SALINIZATION BENEATH DIVERSIFIED IRRIGATED AGRICULTURE,

Agricultural Research Service, Fresno, Calif. Ground Water Recharge Field Station. For primary bibliographic entry see Field 3C. W75-05842

OXYGEN UTILIZATION, DARK ASSIMILA-TION OF CARBON DIOXIDE AND THE RATE OF PHOTOSYNTHESIS IN NAUTRAL AND FIL-TERED WATER SAMPLES. (IN RUSSIAN), Akademiya Nauk SSSR, Moscow. Institut Biologii

V. I. Romanenko, and E. G. Dobrynin.

Mikrobiologiya. Vol 42, No 4, p 573-575. 1973. En-

Descriptors: *Reservoirs, *Water quality, Algae, Filters, Membranes, *Bacteria, *Sampling, Filters, Membranes, *Water analysis. *Sampling,

"Water analysis. Identifiers: Assimilation, Biocenoses, Membrane, Nautral, Oxide, Oxygen, Photosynthesis, Rate, Reservoirs. Samples, Water.

The number of bacteria, the utilization of oxygen and dark assimilation of CO2 remained almost the same in water samples filtered through a membrane filter with the diameter of pores of 3-6 micro; the number of algae decreased almost 8 times. Therefore both the utilization of oxygen and the assimilation of CO2 in the dark in natural biocenoses of reservoirs are mainly due to the activity of bacteria. Copyright 1974, Biological Abstracts, Inc. W75-05846

6. WATER RESOURCES **PLANNING**

6A. Techniques Of Planning

A COMPUTERIZED MODEL FOR DETERMIN-ING THE OPTIMAL WATER UTILIZATION FOR AGRICULTURE,

North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. J. M. Van Deman.

Available from the National Technical Informa-Avanable 11th Revisional Technical Information Service, Springfield, Va 22161 as PB-239 965, \$4.75 in paper copy, \$2.25 in microfiche. MS Thesis, 1973. 89 p, 6 tab, 19 ref, 6 append. OWRT B-068-NC(I). 14-31-001-4114.

Descriptors: *Mathematical models, *Linear programming, Optimization, Agriculture, Water demand, Irrigation, Income, *Water utilization Computer models, Computer programs, Model studies, *Optimal development plans, Water pol-

A mathematical model was derived to determine which crops to grow on what soils under which irrigation policies in order to maximize a net return. The income for growing minus the cost for irrigating a crop determined the per acre return for each crop-soil-irrigation policy combination. Restrictions on crop allotments, soil acreages, and water availability were imposed. Because the restrictions and return were linear, the derived model was a linear programming problem. A user-oriented computer system was developed to solve the model. The system utilized MPS/360 to obtain the optimal solution and to perform post-optimal analyses on the objective function and right hand sides. Also, computer programs were written to determine coefficients, develop the input matrix, and print user-oriented reports from the solution and post-optimal analysis. (McJunkin-North W75-05356

TOWARD A TECHNIQUE FOR QUANTIFYING AESTHETIC QUALITY OF WATER

Utah State Univ., Logan. IWR Contract Report 74-8, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., October 1974. 91 p, 5 fig, 8 tab, 56 ref. P. J. Brown,

Descriptors: *Water resources development,
*Aesthetics. *Evaluaton, *Measurement, "Aesthetics, "Evaluaton, "Measurement, "Senery, Methodology, Analytical techniques, Planning, Effects, Research, Value, Constraints, Psychological aspects, "Water quality, Management, Wildlife habitats, Surveys, Model studies, Systems analysis.

Model studies, Systems analysis.
Identifiers: "Aesthetic opportunity, Quantification, "Subjective analysis, "Landscape aesthetics,
"Straw man model, National goals, Aesthetic
changes, Perceptions, Water aesthetics, Environmental quality, Impact, Public involvement, Social
welfare, Weighting system, Disaggregation
Preferences, Multiple-objective, Regional goals,
Natural environment, Quantitative techniques,
Computer analysis. Computer analysis.

Presented are the proceedings of a colloquim held in Park City, Utah in October of 1972 to explore various means of incorporating aesthetic con-siderations into the water resources planning process. The conference brought together a multi-disciplinary group of experts in the field of natural aesthetics in order to design a strategy to examine and develop the aesthetic opportunity sector of the straw man model. The straw man is heavily oriented toward computerized analysis, hence quantifying the aesthetic effects of water resource development alternatives was a primary topic of discussion during the conference. Aesthetic opportunity is one of nine national goals specified by the Office of Water Resources Research in respect to its sponsorship of the development of a new water resources planning system. The function of this report is not to debate the rationality of the aesthetic opportunity goal model, but rather to focus on how one might deal with the quantification of aesthetic quality changes. Organizationally, the report narrows from a general discussion of criteria for evaluation aesthetic quality quantification schemes to specific concern with quantifying landscape aesthetics, and then broadens again to sum up the general topic. One means of measurement is the examination of surveys taken to determine people's preferences for particular elements in the natural environment. Analyzed are those elements constituting the aesthetic nature of experience. Also, aesthetic opportunity is related to the individual's state of physiological and psychological security. (See W75-05474 thru W75-05479) (Bell-Cornell)

ON THE CRITERIA FOR AND THE POSSIBILI-TY OF QUANTIFYING THE AESTHETIC ASPECTS OF WATER RESOURCE PROJECTS, Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.

In: Toward a Technique for Quantifying Aesthetic Quality of Water Resources. IWR Contract Report 74-8, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., p 6-21, October

*Water resources development. Descriptors: Aesthetics, *Evaluation, Projects, Comprehen-"Aesthetics, "Evaluation, Projects, Comprehensive planning, Economic efficiency, Standards, Measurement, Computer models, Systems analysis, Watersheds(Basins), Model studies. Identifiers: "Environmental quality, "Aesthetic opportunity, "Criteria, "Aesthetic quantification, Multiple objectives, Straw man model, Judgement, Public involvement, Wildland areas.

Increased interest in methods of evaluating water resource projects has led to a significant and continuing re-evaluation. Project feasibility is now being determined by concerns other than just nabeing determined by concerns other than just na-tional economic efficiency. A highly important task today is to evaluate feedback, focusing on the objective of environmental quality. The criteria which must be met by any system designed to quantify aesthetic quality are discussed. Included is a description of studies dealing with the aesthetic appraisal of forest stands. Presented is a list of twelve criteria being used to evaluate and

Techniques Of Planning—Group 6A

judge a new technique for quantifying the public's perceptions of windland areas managed in different ways. Considered are six differentiallyferent ways. Considered are six differentially-managed pine watersheds. The approach is based on extensions of psychology's Theory of Signal Detection and on a systematic conceptual model. Discussed are some ideas regarding the straw man' planning scheme as a possible solution framework for quantifying aesthetics related to water resources development. The 'straw man' allows for comprehensive planning and critical feedback for comprehensive planning and critical feedback. Desirable traits of methods designed to quantify aspects of environmental perception include con-duciveness to public involvement and theoretical soundness. (See also W75-05473) (Bell-Cornell)

AN OVERVIEW: THE DEVELOPMENT OF AESTHETIC OPPORTUNITY CRITERIA AS IT RELATES TO THE PLANNING PROCESS,

Utah State Univ., Logan. J. W. Fuhriman.

J. W. Funriman.
In: Toward a Technique for Quantifying Aesthetic
Quality of Water Resources. IWR Contract Report
74-8, U.S. Army Engineer Institute for Water
Resources, Fort Belvoir, Va., p 22-31, October
1974. 2 tab, 5 ref.

Descriptors: *Water resources development, *Aesthetics, *Evaluation, *Planning, *Methodology, Environmental engineering, Multiple purpose, Value, Regions, Sites, Land use, Attitudes, Recreation.

Identifiers: Quantification, *Aesthetic opportuni-ty, *Environmental quality, Impact, ty, *Environmental *Attractiveness, Criteria.

Considered is the quantification of aesthetic op-portunities as they relate to water resources. The interface between aesthetic opportunity and other relevant planning and design concerns is clarified. Any aesthetic opportunity quantification system should provide a means for evaluating the relationship between aesthetic opportunity and the in-herent quality. Such a system should be developed to yield insight into aesthetic opportunity as it relates to a given broad-scale region and into the aesthetic opportunities that exist in relation to a given function and a specific land-scape/waterscape. Moreover, the system should be readily adaptable to any planning methodology.

A cursory review is given of some current environmental planning methods and related at-titudes/values. Many approaches use a systematic study of natural and cultural resources to determine the inherent qualities of a particular region or site for land use purposes. These resource quali-ties are interpreted in terms of their capacity to withstand impact and/or their ability to be attractive to a given activity or range of activities. Described is a study for determining the attractiveness of a particular site for a given function of ac-tivity. All potential activities were divided into three areas-recreational, residential, and trans-portational--and were grouped according to severi-ty of impact on major site resources. The deter-mination of activities through impact-attractiveness studies provides opportunity for an increased focus regarding observer-use response to the environment. (See also W75-05473) (Bell-Cornell) W75-05475

QUANTIFYING AESTHETIC OPPORTUNITY, Arizona Univ., Tucson. R. Gum, R. Judge, D. Kimball, and W. Wilson.

In: Toward a Technique for Quantifying Aesthetic Quality of Water Resources. IWR Contract Report 74-8, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., p 32-51, October 1974. 2 fig, 4 tab, 12 ref.

Descriptors: *Water resources development, *Water quality, *Planning, *Measurement, *Aesthetics, *Evaluation, *Methodology, Psychological aspects.

Identifiers: Quantification, *Aesthetic opportunity, *Disaggregation, Perceptions, Preferences, Societal goals, Mental indicators, Water aesthetics, Ratio scale, Straw man scheme, Com-parative judgement, Weighting system, Ranking,

Developed are measures of aesthetic parameters designed for inclusion in the planning process. In dealing with weighting schemes to link elements within and between 'straw man' sectors, herein the aesthetic opportunity sector is disaggregated and the techniques for making preference evalua-tions at different points in the framework are outlined. Additionally, the paper describes how to mathematically link one level of the goal hierarachy with another level. A modification of the 'straw man,' the operational planning paradigm forming the basis of this research, is described. Four basic assumptions are followed: (1) societal goals can exist in a branching, tree-like structure; (2) people react to physical, economic, and social facts through their perceptions of these facts; (3) perceptions or mental indicators (i.e., water odor) are the upper structure of the straw man, and the physical indicators (i. e., BOD) are below; and (4) one can acquire directly from peo-ple their preferences and tradeoff between various components of the straw man. The research procedure to redefine the straw man was based on procedure to redefine the straw man was based on a lexicographic analysis of people's perceptions of the components of aesthetic opportunity in combination with a modified Delphi process. Developed were ratio scales of people's preference for changes in the components of the aesthetic opportunity straw man Paculie of procedure of the procedure preserve for changes in the components of the aesthetic opportunity straw man. Results of experimental runs are described in a comparison of normalized group weights as generated by each technique for the components of water aesthetics: odor, floaters, and clarity. (See also W75-05473) (Bell-Cornell) W75-05476

LOOKING THROUGH THE EYES OF THE PUBLIC OR PUBLIC IMAGES AS SOCIAL IN-DICATORS OF AESTHETIC OPPORTUNITY, Idaho Univ., Moscow.

G. J. Cherem.

In: Toward a Technique for Quantifying Aesthetic Quality of Water Resources. IWR Contract Report 74-8, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., p 52-64, October 1974. 2 fig. 2 tab, 2 ref.

Descriptors: *Environment, *Wildlife habitats, *Aesthetics, *Evaluation, Surveys, Photography, Data collections, Measurement, Water resources,

Identifiers: *Aesthetic opportunity, Quantifica-tion, *Landscape aesthetics, *Public images, Change, Trails, Aggregation.

The newly conceived method of user-employed photography has been utilized to measure visitor response to the natural environment. The study response to the natural environment. The study area is the 700-acre wildlife sanctuary of Kensington Metropolitan Park, forty miles northwest of Detroit. Through aggregation of many scenes photographed by users of a nature trail, particular scenes, 'termed public images,' which people tend to photograph over again are identified. A public image photograph is seen as a response to a critical mass of senso-environmental changes occurring within an immediate trail vicinity. For example, coming now paster of the hickney on dry land is a coming upon water after hiking on dry land is a change, or contrasting condition, motivation the picture-taking. The twelve dimensions of senso-environmental change are listed. The dimensions of change, which are basically bi-polar in nature, are discussed in relation to the strength of public inage. The novel technique of user-employed photography is presented as a data collection tool-through the eye of the subject. The perspective of public image as 'public aesthetic preference' is shown to provide a useful theoretical and impirical tool for the quantification of sethetic process. tool for the quantification of aesthetic opportuni-ty; it has direct application to water-based aesthetics. (See also W75-05473) (Bell-Cornell)

W75-05477

UNDERSTANDING SCENES: AN EVALUATION TECHNIQUE, Utah State Univ., Logan.

P. J. Brown.

In: Toward a Technique for Quantifying Aesthetic Quality of Water Resources. IWR Contract Report 74-8, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., p 65-75, October 1974, 16 ref.

Descriptors: *Aesthetics, *Evaluation, *Methodology, *Measurement, *Scenery, Water resources, Planning, Photography, Regional analysis, Surveys, Model studies, Psychological aspects, Feasibility.

Identifiers: *Environmental quality, *Landscape aesthetics, *User preferences, Quantification, Gestalt psychology, Rating, Indexing, Visual aestheticism.

The analysis of landscapes, and innate pattern recognition and cultural enhancement of aesthetic quality are discussed. What is aesthetic is what is easy to see and what is good in our experience. Considered are Gestalt Psychology's observations of what constitutes visual aestheticism. Orderliness of the arrangements of elements in a scene is a factor. For a scene to be aesthetic, the right amount of information provided. A general outline of a method for quantifying aesthetic quality is given. A two-stage evaluation of scenes is proposed in which the researcher (or planner) determines how scenes are put together and then evaluates them with respect to cultural norms. Using photos of the scenes, the elements of the scenes can be examined in relation to user preferences for the scenes, thus identifying which particular scenic elements are significant for measuring aesthetic quality. Described is a model ex-plaining 66% of the variation in landscape aesthetic preference scores. Such scores become the tools for describing aesthetic quality. Considered is the usefulness of such evaluation for water resources planning. Next, a more explicit statement of the method and a technique for studying the method to determine its feasibility are given. Use of the method for scene analysis is discussed in which the scene elements to be ex-amined are presented followed by how they might be studied and quantified. The applicability of this method to regional analysis of visual aesthetic quality is given. (See also W75-05473) (Bell-Cor-W75-05478

INDICATORS FOR AESTHETIC OPPORTUNI-

Bureau of Land Management, Washington, D.C.

Bureau of Linu Management, Management, Inc. Newby.

In: Toward A Technique for Quantifying Aesthetic Quality of Water Resources. IWR Contract Report 74-8, U.S. Army Engineer Institute

East Ralvoir, Va. p. 76-87. for Water Resources, Fort Belvoir, Va., p 76-87, October 1974, 8 ref.

*Evaluation. *Scenery, Descriptors: *Psychological aspects, *Aesthetics, *Environment, Planning, Decision making, Management, Resources development. Identifiers: *Aesthetic opportunity, Pattern recognition, Human development, Social welfare, Human behavior, Quantification, Predictive

How one might evaluate the basic components of scenes which are related to innate and learned pattern recognition is discussed. Several techniques for evaluation are proposed. Aesthetic opportunity is related to the relative state of physiological and psychological security enjoyed by an individual. Considered are human development and growth in terms of needs and goals. Whether or not man is consciously concerned about the aesthetics of his environment, he is searching for meaning, cohe-

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Group 6A—Techniques Of Planning

sion, and order in his surroundings. Predictability and relative complexity are environmental quali-ties which influence whether or not a person has an opportunity for an aesthetic experience. With order and complexity being essential environmen-tal elements, it is assumed that quantification of these elements could lead to the development of an analytical predictive model for resource deci-sion-making. It is recommended that the social and behavioral scences become an integral part of resource or environmental management, since social welfare can be achieved only when man begins to plan, develop, and manage with the environ-ment and himself as a collective entity. (See also W75-05473) (Bell-Cornell) W75-05479

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING, BENEFITS OF PROTECT-ING URBAN FLOODPLAINS, Washington Univ., St. Louis, Mo. Inst. for Urban

and Regional Studies.

For primary bibliographic entry see Field 4A. W75-05481

AN EVALUATION OF WATER REUSE FOR

MUNICIPAL SUPPLY, Southern Illinois Univ., Carbondale. For primary bibliographic entry see Field 5D. W75-05482

AUTOMATIC CONTROL OF LARGE-SCALE COMBINED SEWER SYSTEMS, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. For primary bibliographic entry see Field 5D. W75-05608

PROBABILISTIC MODEL OF RARE HYDROLOGIC EVENTS, Arizona Univ., Tucson. Dept. of Watershed

Management.

For primary bibliographic entry see Field 2A. W75-05766

A DECISION-AIDING MODEL FOR PLANNING OPTIMAL RESOURCE ALLOCATION OF WATER BASINS, Arizona Univ., Tucson. Dept. of Watershed

Available from the National Technical Informa-Name Tion Service, Springfield, Va 22161 as PB-240 286, \$5.75 in paper copy; \$2.25 in microfiche. Ph D Dissertation, 1974. 132 p, 14 fig, 19 tab, 69 ref, 2 append. OWRT B-032-ARIZ(6), 14-31-0001-3858.

Descriptors: *Optimum development plans, *Arizona, Basins, *Watershed management, Decision making, Optimization, Mathematical models, Stephasic Stochastic processes, Simulation analysis, Systems analysis, *Model studies, Planning, *Resource allocation, *Dynamic programming, *Linear programming, *Water distribution(Applied).

The water basin model employs two methods of system analysis for developing optimal management plans. These two methods, linear programming and dynamic programming, are used in a hierarchial combination for comparing alternatives on water basins. The model links both on and off-site uses of basins in a rational combination of levels. The multilevel model considers the pittial condition and potential of vesetation cliinitial condition and potential of vegetation, climate, and soils at the lowest level and proceeds through a hierarchial scheme to arrive at allocation of budgetary resources among response units and subwatersheds. For an array of basin investment levels, the guide indicates how the water should be allocated among on- and off-site uses using a dynamic program, how the investment should be allocated among sub-watersheds using a dynamic

program, and how the investment should be allocated among development alternatives on each subwatershed using a linear program. A test run of model was made on an existing basin northern Arix. using forage grazing as the on-site use and water for irrigation as the off-site use. Basic inventory data obtained from the Bureau of Land Management provided input for determining ecologic and hydrologic response to on-site gement. The sensitivity of plans to on-site benefits from forage harvest was examined and showed that direct benefits to the federal government do not justify development expense. How-ever, on-site development was indicated when benefits were based on the corresponsing value that private firms given for grazing forage. The model serves three useful functions: (1) provides preliminary guides for managers, (2) brings to light future research needs, and (3) provides impetus for developing better models. W75-05770

INVENTORY THEORY APPLICATION TO THE OPTIMUM CONTROL OF IRRIGATION

WATER, Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.

Marcia A. Gonzalez de de la Fuente.

National Techi

Available from the National Technical Informa-tion Service, Springfield, Va 22161, as PB-240 288. \$4.25 in paper copy, \$2.25 in microfiche. M. S. Thesis, 1974. 53 p, 10 fig, 21 ref. OWRT B-032-ARIZ(7). 14-31-0001-3858.

Descriptors: Watershed management, Decision making, *Optimization, *Mathematical models, Stochastic processes, *Simulation analysis, Systems analysis, Model studies, *Irrigation water, *Soil water, Water levels, Demand.
Identifiers: *Inventory models, *Evaporative de-

This study was centered mainly in the use of inventory models to find an optimal solution to the problem of what soil water level to maintain in order to obtain the maximum profit from an irorder to obtain the maximum profit from an irrigated crop. To set up the mathematical models some simplifying assumptions were made. It was assumed that the rate of evapotranspiration is uniform, although it is known that this rate decreases as the available water content appears. proaches zero. This assumption is not a need since inventory theory can handle a curvilinear relation-ship. All models presuppose that there is no restriction in the availability of water; the operation os systems for delivering irrigation water to the farmer is another problem that could be easily handled by inventory models. The models developed here take account of the stochastic nature of the evaporative demand and its depen-dence on rainfall during the growing period, and the more realistic situation in which the lag time in delivering water to the soil is positive can be in-cluded. Moreover, multi-product inventory models can be used to simulate the storage of water, fertilizer, and salts simultaneously. The requirements for the use of these models for the anagement of irrigation systems are the availability of data on the evaporative demand of a crop, short-term forecasts on rainfall probabilities, and that the farmer keeps track of the water level in the soil reservoir. The limitations for the development or adaptation of other inventory models as suggested above are very few. W75-05771

WATER SUPPLY, TREATMENT, DISTRIBU-TION, AND REUSE OPTIMIZATION IN ARID URBAN AREAS, Colorado State Univ., Fort Collins. Dept. of

Agricultural Engineering. W. R. Walker, G. V. Skogerboe, and R. C. Ward. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 289, 53.25 in paper copy, \$2.25 in microfiche. Paper presented at the Ninth American Water Resources Conference, Olympic Hotel, Seattle, Washington, October 21 - 26, 1973. 22 p, 7 fig, 18 ref. OWRT B-

Descriptors: Agricultural transfer, *Institutional constraints, Interbasic transfer, Optimization, Recycling, *Water distribution(Applied), Water quality, Water resources, Water treatment, Cities, *Water supply, *Water reuse, Model studies, *Colorado, Costs. Identifiers: Arid-urban areas, Denver(Colo).

A management level model has been formulated in which a systematic analysis format is employed to answer some of the basic questions regarding urban water management strategies. The model in-corporates a multilevel optimization scheme to coordinate urban water supply, distribution, and wastewater management. A test of the model's utility is made in an application to the water management problems of the Denver, Colorado metropolitan area. Denver has utilized both agricultural transfers and transmountain diversions to supplement the natural stream resources of the South Platte River. Although plans are being made to increase the capacity of these sources, in-creasingly stringent standards on the area's effluents are enhancing the feasibility of reclaiming and recycling a portion of the wastewater. The urban model used in this study indicates the decision points at which respective strategies are introduced. However, by formulating the model from a planner's viewpoint, the most important results gained from the analysis are the costs of various institutional constraints which may restrict the decision maker's ability to implement optimal policies. W75-05773

OPTIMAL ALLOCATION OF WATER QUALI-CONTROLS IN URBANIZING RIVER

BASINS, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 5G. W75-05774

A SYSTEMS APPROACH TO THE OPERATION OF FLOOD CONTROL RESERVOIRS, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 4A. W75-05784

THE PHOSPHORUS-CHLOROPHYLL RELA-TIONSHIP IN LAKES, Toronto Univ. (Ontario). Dept. of Zoology For primary bibliographic entry see Field 2H. W75-05837

6B. Evaluation Process

COMMERCIAL NAVIGATION ON THE UPPER MISSISSIPPI RIVER: AN ECONOMIC REVIEW OF ITS DEVELOPMENT AND PUBLIC POLICY ISSUES AFFECTING MINNESOTA, Minnesota Univ., Minneapolis. Dept. of Agriculture and Applied Economics. For primary bibliographic entry see Field 4A. W75-05353

A STUDY OF AESTHETIC PREFERENCES, Wyoming Univ., Laramie. Dept. of Sociology. J. P. Mitchell. Available from the National Technical Informa

tion Service, Springfield, Va 22161 as PB-239 966, \$5.25 in paper copy, \$2.25 in microfiche. MA Thes-is, December 1974. 126 p. 41 tab, 28 ref, 4 append. OWRT A-018-WYO(2).

Descriptors: *Wyoming, *Aesthetics, *Attitudes, *Social values, *Scenery, Psychological aspects, Surveys, Evaluation, Economic impact, Wild

Identifiers: Socioeconomic variables, Social preferences.

Effects of specific socio-economic variables upon the preferences of Wyoming citizens towards outdoor water-related scenery, were investigated. A sample composed of 237 respondents from various areas of Wyoming were interviewed. Preferences were measured by the ranking of color photographs, representing outdoor water-related scenes common to the state of Wyoming, from best-liked to least-liked. It was discovered that socioeconomic variables have a minimal relationship with aesthetic preferences. Further research concentrating upon individual factors was recommended. W75-05359

MEASURING THE SOCIAL ATTITUDES AND AESTHETIC AND ECONOMIC CONSIDERATIONS WHICH INFLUENCE TRANSMISSION LINE ROUTING,
Battelle-Pacific Northwest Labs., Richland,

For primary bibliographic entry see Field 6G. W75-05391

SOCIO-ECONOMIC IMPACTS OF RURAL WATER SUPPLIES, University of Southern Mississippi, Hattiesburg.

Dept. of Economics.

D. C. Williams, Jr., and C. P. Cartee.
Water Resources Bulletin, Vol 10, No 1, p 144152, 1974. 5 ref. OWRR A-060-MISS (2).

Descriptors: *Rural areas, *Domestic water, Water management(Applied), Administration, Local government, Water supply, Economic im-Government support, Planning, Social pact, aspects. Identifiers: *Farmers Home Administration.

By the end of fiscal year 1973, the Farmers Home Administration had financed over 7,561 water and Administration and financed over 7,501 water and sewer systems at a cost in excess of \$2 billion. Coupled with the growing number of water systems, however, has been increased questioning of the systems' efficiency and adequacy of operations. To illustrate the problem a survey was conducted of the managerial practices of 534 rural water systems in Mississippi. Results based upon a 34% response, indicated that 87% of the operators were partiting. Only 20% of the systems has an inwere part-time. Only 20% of the systems has an inhouse program for testing some aspects of water quality, while over 53% reported no form of water treatment. Under new directives, however, all will be required to have a minimum of chlorination. The survey indicated no significant economies of scale associated with the operation of larger systems. Several operational alternatives and recommendations were discussed: (1) integration of system operations by contracted services; (2) combination of individual systems for operation and maintenance; and (3) greater county-wide system planning, development, and operation. Several direct and indirect impacts-residential and commercial development and greater social amenities associated with the system's develop-ment-are also noted. (Schroeder-Wisconsin) W75-05407

INTERIM WATER QUALITY PLAN FOR THE MINNEHAHA COUNTY STANDARD MINNEHAHA COUNTY STANDARD METROPOLITAN STATISTICAL AREA AND DISTRICT II.

South Eastern Council of Governments, Sioux Falls, S. Dak.

December 1973. p 156, 3 fig, 3 tab, 5 append, 17 ref. AUD grant.

Descriptors: *Planning, *Water resources development, *Wastewater disposal, *Cities, *South Dakota, *Municipal water, Water supply development, Urbanization, Governments, Metropolitan studies, Baseline studies, Sewerage,

Sewage treatment, Environmental control, On-site data collections. Identifiers: *Sioux Falls(South Dakota).

A summary is presented of problems and needs in public water supply and wastewater facilities in Minnehaha County Standard Metropolitan Statistical Area (SMSA), South Dakota. The planning area lies almost entirely within the Big Sioux River Basin which drains from northeastern South Dakota into the Missouri River, just North of Sioux City, Iowa. Skunk Creek, which drains about 5000 square miles, is the main tributary. Sioux Falls is the largest contained city, with a 1970 population of 72,488. All the satellite communities surrounding Sioux Falls are expected to show continued population growth. This increase will require improved and expanded water and sewage facilities, creating even heavier demands on community budgets already strained. Capital improvements programming will become an absolute necessity. Manufacturing is the single most important element in the region's economy, providing 20% of the total employment in the planning area. The quality of the ground and surface waters in the dual areas which appear to be experiencing more than normal degradation. Summaries are given of the conditions of water and wastewater facilities in each of the communities within the SMSA and the needs and proposed improvements in each community. Available financing options are reviewed. (Poertner) W75-05421

COMPREHENSIVE WATER AND SEWER PLAN, BRADLEY COUNTY, TENNESSEE.
Sanders (B.G.) and Associates, Inc., Atlanta, Ga. Southeast Tennessee Development District, Atlanta, Georgia, June 1972. p 112, 8 fig, 14 tab. No.

*Water Descriptors: *Sewerage, *Planning, *Tennessee, *Public utilities, Governments, Long-term planning, Regional analysis, Water supply development, Cities, Urbanization, Water resources development, Comprehensive planning, Regional development.
Identifiers: *Bradley County(Tennessee).

The purpose of the study was to investigate the present and future demands for water supply and sewerage services and to develop a coordinated and comprehensive plan to furnish Bradley County, Tennessee with such services. The study is primarily concerned with the needs of the rural, unincorporated portions of the County, but clearly recognizes the tremendous influence and potential of the County's growth center--Cleveland. Part I of the report contains the basic background studies upon which the plan is based. These include a thorough analysis of past and projected population and economic trends, existing and forecasted land use patterns, and pertinent physical conditions such as topography, soils, utilities and transportation networks. Part II provides an evaluation of existing water and sewerage systems with respect to their adequacy to meet present and future demands. Goals and objectives are formulated, and an area-wide, integrated plan for water and sewerage systems improvement presented. Action recommendations are oriented toward assuring the implementation of the proposals. The proposals envision the development of integrated water and sewer systems sufficient to serve the entire population and industrial needs of Bradley County through 1990. Recommendations for the Countywide water system include the ultimate creation of a vast base circle loop, utilizing the expanded Cleveland system as the initial framework. The ultimate sewer plan proposals are based upon the construction of new treatment facilities and large gravity trunk lines. (Poertner) W75-05430

ALTERNATIVE METHODS OF EVALUATING THE ECONOMIC AND SOCIAL ASPECTS OF WATER QUALITY, Rutgers - the State Univ., New Brunswick, N.J. Dept. of Economics.

For primary bibliographic entry see Field 5G. W75-05445

LAND-USE CHANGES AND THE ECONOMIC EVALUATION OF NATURAL VIRGINIA PINE STANDS ON THE DIAL CREEK WATERSHED, DURHAM COUNTY, NORTH CAROLINA, North Carolina State Univ., Raleigh. School of Forest Resources. For primary bibliographic entry see Field 4D. W75-05446

AN EVALUATION OF THE RESEARCH PROGRAM FOR THE STATE OF WASHINGTON WATER RESEARCH CENTER.

Washington State Water Research Center, Pull-

Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 007, \$3.75 in paper copy; \$2.25 in microfiche. Report No. 18, July 1974, 42 p. (Prepared by Joint Scien-tific Committee and Water Research Center Staff.) OWRT A-999-WASH(6).

Descriptors: *Washington, *Water resources Institute, Planning, Research priorities, Water policy, *Future planning(Projected), Projects, icy, *Futi Evaluation. Identifiers: *Research needs.

The State of Washington Water Research Center, formed on November 11, 1964, immediately set it-self to assessing the state's water research needs. The resulting document formed the basis for establishing need for research projects of the Center in ensuing years. Since that time, several changes have taken place in the field of water policy which required a re-examination of research needs in the state of Washington. Accordingly, in late 1971 the Center's Joint Scientific Committee undertook to reassess the water research needs for the state of Washington. This document should be considered as a background paper for future programs of the Center. W75-05455

SOME POLLUTION-RELATED ATTITUDES OF HIGH SCHOOL YOUTH IN THE UNITED STATES AND BRAZIL, Illinois Univ., Urbana, Dept. of Sociology.

For primary bibliographic entry see Field 5G. W75-05461

MUNICIPAL AND INDUSTRIAL REIMBURSE-MENT FOR A WATER RESOURCE PROJECT IN WYOMING'S PLATTE RIVER BASIN, Wyoming Univ., Laramie. Div. of Agricultural Economics For primary bibliographic entry see Field 6C. W75-05472

TOWARD A TECHNIQUE FOR QUANTIFYING QUALITY RESOURCES. Utah State Univ., Logan.

For primary bibliographic entry see Field 6A. W75-05473

AN OVERVIEW: THE DEVELOPMENT OF AESTHETIC OPPORTUNITY CRITERIA AS IT RELATES TO THE PLANNING PROCESS, Utah State Univ., Logan. For primary bibliographic entry see Field 6A. W75-05475

QUANTIFYING AESTHETIC OPPORTUNITY, Arizona Univ., Tucson.

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Group 6B-Evaluation Process

For primary bibliographic entry see Field 6A. W75-05476

LOOKING THROUGH THE EYES OF THE PUBLIC OR PUBLIC IMAGES AS SOCIAL INDICATORS OF AESTHETIC OPPORTUNITY, Idaho Univ., Moscow.
For primary bibliographic entry see Field 6A. W75-05477

UNDERSTANDING SCENES: AN EVALUATION TECHNIQUE, Utah State Univ., Logan. For primary bibliographic entry see Field 6A. W75-05478

EVALUATION OF QUALITY PARAMETERS IN WATER RESOURCE PLANNING (A STATE-OF-THE-ART SURVEY OF THE ECONOMICS OF WATER QUALITY), For primary bibliographic entry see Field 5G. W75-05483

A GENERIC METHODOLOGY TO FORECAST BENEFITS FROM URBAN WATER RESOURCE IMPROVEMENT PROJECTS,

Dornbusch (David M.) and Co., Inc., San Francisco, Calif.

cisco, Calif.
D. M. Dornbusch, and C. O. Falcke.

D. M. Dornbusch, and C. O. Packe. Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 209, \$7.00 in paper copy, \$2.25 in microfiche. Completion Report, November 1, 1974. 173 p, 25 fig. 20 tab, 39 ref, 4 append. OWRT C-5065(No 4201)(1).

Descriptors: *Pollution abatement, *Property values, *Direct benefits, Wildlife, Recreation, Aesthetics, Algae, *Planning, Regression analysis, *Forecasting, Methodology, *Econometrics,

Aesthetics, Algae, *Planning, Regression analysis, *Forecasting, Methodology, *Econometrics, Water quality, Evaluation, Cities.
Identifiers: Perception survey instruments, *Urban water resources, Case site descriptors, Debris, Clarity, Seattle(Wash), Mystic River(Conn), Marion Millpond(Wisc), Willamette River(Ore), Kanawha River(West Virginia), Rockaway River(New Jersey).

Environmental amenities with locational relations to residential property are reflected in the market price for that property. A model expressing the relationship between benefits, measured by changes in real property values, and water quality improvement, was estimated using econometric techniques and opinion surveys. Results showed that lay people relate water quality in terms of the following categories listed in order of perceived importance: (1) wildlife support capacity, (2) recreation opportunity, and (3) aesthetic comprising industrial wastes, clearness, odor, debris and algae. An index measuring residents' perception of water quality changes was constructed to reflect the relative valuation of each category and the sensitivity of benefit gains to threshold and leveling-off effects. Residents' opinions about water quality changes at a given water body differ sharply and non-systematically from those of water quality experts. The amount of benefits in terms of increased property values derivable from water pollution abatement varies with perceived water quality change, type and size of water body, and, most significantly, extent and character of non-waterfront residents' visual and physical access to the water body. A generic method to assess property value changes in terms of these variables is presented in tabular form. No regional variation in the attainable benefits was detected.

PUBLIC PERCEPTIONS OF WATER QUALITY IN A METROPOLITAN AREA, Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering. For primary bibliographic entry see Field 5G. W75-05605

VALUATION OF A GROUND-WATER SUPPLY FOR MANAGEMENT AND DEVELOPMENT, Nevada Univ., Reno. For primary bibliographic entry see Field 4B. W75-05613

A TAX SYSTEM FOR GROUNDWATER MANAGEMENT, Geological Survey, Reston, Va. For primary bibliographic entry see Field 6C. W75-05654

A TIME-SPACE TECHNIQUE TO ANALYZE SNOWPACKS IN AND ADJACENT TO OPENINGS IN THE FOREST, Arizona Univ., Tucson, Dept. of Watershed Management. For primary bibliographic entry see Field 4A. W75-05764

MANAGEMENT OF SUBSIDING LANDS: AN ECONOMIC EVALUATION, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. For primary bibliographic entry see Field 4B. W75-05765

PROCEDURES FOR DEVELOPING A MODEL FOR PLANNING WATERBASED LINEAR PARKS ALONG STREAM CHANNELS IN SEMIARID URBAN REGIONS, Arizona Univ., Tucson. Dept. of Watershed

R. C. Johnson.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 326, \$5.25 in paper copy, \$2.25 in microfiche. Master of Science Thesis, 1973. 100 p, 15 ref, 3 tab, 53 ref. OWRT B-023-ARIZ(5). 14-31-0001-3556.

Descriptors: Watershed management, Optimum developments plans, *Urbanization, Water management(Applied), Water reuse, Parks, *Recreation, Model studies, Streams, Channels, Flood control, *Small watersheds, *Arizona, Watersheds(Basins), Natural resources, Land use, Constraints, Environmental effects.

Identifiers: Semi-arid urban regions, Linear park systems. Anklam watershed(Ariz).

Development of procedures for a water-based linear park planning model has been undertaken to encourage recreation planners to use stream channels and flood plains within small watersheds in semiarid urban regions for recreation and flood control purposes. Dry stream channels should be utilized as the core of the linear park system which would include horse, bicycle, and hiking trails, picnic and play areas; natural vistas and desert buffer strips; lakes; and also be part of a larger continuous metropolitan recreation system. Localized flood damage may also be reduced within small watersheds by diverting portions of storm runoff from main washes into off-channel basins. Water impounded in these basins may be retained for recreational purposes or released after peak flow into the main channel. Planning procedures outlined include: a statement of goals and objectives, an inventory of natural resources, an analy-sis of urban land use patterns, consideration of legal and administrative constraints, econ feasibility, examination of criteria for site selection and design, environmental impact analysis, and review of procedures for plan implementation. m Watershed, located on the eastern slope of the Tucson Mountains, Arizona, has been utilized as the model area for the conceptual development of a linear park system. W75-05769

PROCEDURE FOR ESTIMATING TOTAL FLOOD DAMAGE IN URBAN AREAS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 4A. W75-05776

CRITERIA FOR EVALUATION OF URBAN DRAINAGE AND FLOOD CONTROL, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 4A. W75-05778

A SOCIO-ECONOMIC EVALUATION OF ALTERNATIVE WATER MANAGEMENT POLICIES ON THE RIO GRANDE IN NEW MEXICO, New Mexico State Univ., University Park. Dept. of Agricultural Economics. R. R. Lansford, and T. G. Gebhard, Jr. Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 468, \$3.75 in paper copy, \$2.25 in microfiche. Presented at American Society of Civil Engineers Conference, September 27, 1974, Amarillo, Texas. 31 p, 7 fig, 9 tab. OWRT A-045-NMEX(7).

Descriptors: *New Mexico, Water resources, *Water demand, Economics, *Water resources development, Management, *Economic prediction, *Surface-groundwater relationships, Natural resources, Water requirements, Resource allocation, River Basin Groundwater management, Water quality, Water tuilization, Human population, Employment, Industrial water recreation, *Water management(Applied), Linear programming.

gramming.

Identifiers: *Rio Grande Basin(N Mex), *Socioeconomic models, Groundwater appropriation,
Input-output coefficients, Surface-groundwater
conjunctive use model, Economic land classification, Mathematical groundwater model.

An interdisciplinary approach to the solution of the water resource problems of the Rio Grande region in New Mexico was made possible by the integration of hydrology, geology, and engineering with economics. Research procedures developed to carry out this study were closely coordinated by the investigators to achieve the primary objective of evaluation of the social and economic impacts of alternative water-use policies. A socio-economic model was developed to represent the New Mexico economy, with special emphasis placed upon the Rio Grande region. Inputs into the socio-economic model were obtained from separate studies covering the hydrological, agricultural, municipal and industrial areas. Three sets of alternatives were considered: (1) growth without a water constraint; (2) growth, holding surface water constraint; (3) growth, holding both surface and ground water constraint. Without a water constraint, both production and depletions are expected to exhibit the largest increase (59.2 percent and 49.6 percent, respectively). When a surface water constraint is imposed, the value of production is reduced by only \$5.6 million in the year 2000, and by \$14.2 million in 2020; water depletions are expected to decrease about 27 percent by 2020. When a total water constraint is imposed, the value of production is decreased \$2.7 million below that expected when using only a surface water constraint, and water depletions are reduced only slightly. (Hain-New Mexico State)

EVALUATION OF POPULATION GROWTH AND PER CAPITA CONSUMPTION OF WATER ON THE REGIONAL ECONOMIC GROWTH IN THE RIO GRANDE REGION IN NEW MEXICO, New Mexico State Univ., University Park. Dept. of Agricultural Economics. R. R. Lansford, S. Ben-David, T. G. Gebhard, Jr., W. Brutsaert, and B. J. Creel.

Available from the National Technical Information Service, Springfield, Va. 22161 as PB-240 485, \$3.25 paper copy, \$2.25 microfiche. Presented at Natural Resource and Environmental Economics, American Agricultural Economics Association Summer Meeting, August 18-21, 1974, College Sta-tion, Texas, Texas A and M University, 13 p, 1 fig, 2 tab, 5 ref. OWRT A-045-NMEX (6).

Descriptors: *New Mexico, Water resources, *Water demand, Economics, *Water resources development, Management, *Economic prediction, *Surface-groundwater relationships, Natural resources, Water requirements, Resource allocation, River basins, Groundwater management, Water quality, Water utilization, Human popula-tion, Employment, Industrial water, Recreation, *Water management(Applied), Linear

gramming. Identifiers: *Rio Grande Basin(NMex), *Socioeconomic model, Groundwater appropria tion, Input-output coefficients, Surface-groundwater Conjunctive use model, Economic land clas-sification. Mathematical groundwater model.

A socio-economic model was used to estimate the effects of alternative population projections and domestic per capita consumption estimates on distribution of production and water requirements between 1970 - 2020. The results indicate that there netween 1970 - 2020. In resource indicate that there are sufficient water resources in the Rio Grande Region to carry on a viable regional economy under all four alternatives: (1) Low Population (BEA) - 1970 Per Capita Water Consumption Schedule (2) Low Population (BEA) - State Water Plan Per Capita Consumption Schedule (3) High Plan Per Capita Consumption Schedule (3) High Population (OBERS) - 1970 Per Capita Water Consumption Schedule (4) High Population (OBERS)-State Water Plan Per Capita Consumption Schedule (Hain-New Mexico State)

PLANNING THE DEVELOPMENT OF WATER RESOURCES, Queensland Irrigation and Water Supply Commis-

on, Brisbane (Australia). Systems Branch. W. C. Boughton

Journal of Hydrology (New Zealand), Vol 13, No 1, p 1-13, 1974. 4 fig, 2 tab.

Descriptors: *Water resources development, *Project planning, *Cost-benefit analysis, *Feasibility studies, *Environmental effects, Computers, Simulation analysis, Assessments, Input-output analysis, Evaluation, Economics, Engineering, Planning, Water allocation,

*Australia. Identifiers: *Leopold matrix, Environmental impact studies.

Until 1950, the dominant concern in planning the development of water resources in Australia was engineering feasibility. About 1950, interest in the economic analysis of water resources development increased substantially. At present, the three major components of planning the development and allocation of water resources are engineering investigations, economic evaluations, and en-vironmental impact studies. The engineering in-vestigations are much better developed than the corresponding economic and environmental stu-dies. Computers have greatly aided in these investigations. Economic evaluations of a water resources development project are benefit-cost evaluations that consider both tangible and intangible factors. Economic evaluations now ex-tend from comparisons of direct project benefits and costs to regional analysis with input-output transaction matrices. There is a profusion of ac-tions and effects involoved in environmental evaluation of water development works. Environmental evaluation techniques were illustrated by the Leopold matrix and the Batelle system. Development planning techniques are themselves developing in response to demands for more detailed and diverse assessments. (Singh-ISWS)

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ALTERNATIVE METHODS OF EVALUATING THE ECONOMIC AND SOCIAL ASPECTS OF WATER QUALITY,
Rutgers - the State Univ., New Brunswick, N.J.

Dept. of Economics. For primary bibliographic entry see Field 5G. W75-05445

MUNICIPAL AND INDUSTRIAL REIMBURSE-MENT FOR A WATER RESOURCE PROJECT IN WYOMING'S PLATTE RIVER BASIN, Wyoming Univ., Laramie. Div. of Agricultural Economics.

C. E. Huff. Available from the National Technical Informa-tion Service as PB-239 998, \$5.75 in paper copy, \$2.25 in microfiche. M.S. Thesis, March 1974, 135 p, 5 fig, 14 tab, 41 ref, 4 append. OWRT C-4351 (9063)(3).

Descriptors: *Wyoming, Projects, *Cost repayment, *Income, *Economic impact, Equity, *Economic efficiency, Administration, Industries,

Identifiers: *Platte River Basin (Wyo), *Coal in-

The study consisted of an analysis of current and proposed reimbursement mechanisms pertaining to municipal and coal industry growth from an interbasin water diversion to Wyoming's Platte River Basin. Criteria used in the analysis were: (1) efficiency, (2) equity, (3) revenue rasing ability, and (4) administrative feasibility. The impacts and reimbursement flows affecting the business sector, government sector, and household sector were depicted in impact and reimbursement matrixes for Converse County, Wyoming. The conclusions pointed out the need for several changes in, or additions to, the present system of reimbursement mechanisms. W75-05472

VALUATION OF A GROUND-WATER SUPPLY FOR MANAGEMENT AND DEVELOPMENT. Nevada Univ., Reno.

For primary bibliographic entry see Field 4B. W75-05613

A TAX SYSTEM FOR GROUNDWATER MANAGEMENT, Geological Survey, Reston, Va.

T. Maddock, III, and Y. Y. Haimes. Water Resources Research, Vol 11, No 1, p 7-14, February 1975. 4 tab, 14 ref.

*Water Descriptors: management(Applied), Taxes, *Groundwater resources, Water alloca-ion(Policy), Administration, Water distribution(Policy), Administration, Water distribu-tion(Applied), Water rights, Water conservation, Irrigation water.
Identifiers: *Groundwater management.

A tax scheme was developed to create an incentive among users to conserve groundwater and reduce the external diseconomies that pumping produces. Quotas are established for wells by using an agricultural management model. If a user pumps more than the quota established for his well, he may be assessed a tax; if a user pumps less than his quota, he may be entitled to a rebate. How-ever, taxes are collected and redistributed in such a way that zero taxes are accumulated from year to year. (Knapp-USGS) W75-05654

MANAGEMENT OF SUBSIDING LANDS: AN ECONOMIC EVALUATION, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

For primary bibliographic entry see Field 4B. W75-05765

IMPLEMENTATION OF THE FEDERAL WATER PROJECT RECREATION ACT IN

Colorado State Univ., Fort Collins, Dept. of Political Science. For primary bibliographic entry see Field 6E. W75-05772

6D. Water Demand

COMMERCIAL NAVIGATION ON THE UPPER MISSISSIPPI RIVER: AN ECONOMIC REVIEW OF ITS DEVELOPMENT AND PUBLIC POLICY ISSUES AFFECTING MINNESOTA, Minnesota Univ., Minneapolis. Dept. of Agricul-

For primary bibliographic entry see Field 4A.
W75-05353

A COMPUTERIZED MODEL FOR DETERMIN-ING THE OPTIMAL WATER UTILIZATION

FOR AGRICULTURE,
North Carolina State Univ., Raleigh. Dept. of
Biological and Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W75-05356

THE IMPACT OF ENERGY DEVELOPMENT ON WATER RESOURCES IN ARID LANDS, LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY, Arizona Univ., Tucson. Office of Arid Lands Stu-

dies.

For primary bibliographic entry see Field 3E. W75-05471

AN EVALUATION OF WATER REUSE FOR

MUNICIPAL SUPPLY, Southern Illinois Univ., Carbondale. For primary bibliographic entry see Field 5D. W75-05482

ESTIMATION OF COMMERCIAL, INDUSTRI-AL AND GOVERNMENTAL WATER USE FOR

AL AND GOVERNMENTAL WATER USE FOR LOCAL AREAS, California Univ., Santa Barbara. L. J. Mercer, and W. D. Morgan. Water Resources Bulletin, Vol 10, No 4, p 794-801, August, 1974. 3 tab, 10 ref.

Descriptors: *Water utilization, *Water users, Water demand, "Water use, Consumptive use, Water policy, Water management, Water resources, Water supply, "California, Water, Water allocation, Water delivery, Projections, Planning, Estimating, Water resources development, Estimating equations, Regional analysis, Analysis, Management.
Identifiers: SIC Code, *Non-residential water use,

CIG use(Commercial-industrial-governmental), Santa Barbara County(Cal), Water use.

A method to estimate non-residential (commercial. industrial, and government) water use for a regional water service area in Santa Barbara County, California, is discussed. While the geographic and economic area studied is relatively large and includes several water districts, costs were relative-ly small and techniques easily used. Estimated water use per employee by two-digit SIC (Standard Industrial Classification) and by broad categories is presented. For the area involved, the est water use per employee occurs in the arboreta and botanical-zoological gardens (SIC 84). With small employment, however, this has a minimal impact on total water use. The second highest water user is the food preparation and processing industry. The amount of water used by

Field 6-WATER RESOURCES PLANNING

Group 6D-Water Demand

government and service industries accounts for a higher proportion of non-residential water use than is commonly thought. This is especially important to urban areas which do not have he water use by manufacturing. A useful extension of this framework is to develop a continuing series of variety of planning problems for both local and regional water agencies, including improved projections for water use. (Grden-North Carolina) W75-05604 water use by SIC. Results can then be applied to a

APPLICATION OF THE ALEKSANDRA MINERAL WATER FROM WYSOWA AND ITS SALT TABLETS IN THE TREATMENT OF DUODENAL ULCERS, (IN POLISH), Military Hospital, Poznan (Poland). J. Durkalec.

Descriptors: *Mineral water, Water types, *Treatment, *Public health, Human diseases, Salt

Balneol Pol Vol 17, No 4, p 421-425, 1972.

water.
Identifiers: Aleksandra, Duodenal ulcers, Poland, Treatment, *Ulcers, Spas, Salt tablets.

Comparative clinical examinations indicated the positive influence of 'Aleksand'a' from Wysowa mineral water, or water from its tablets, in treating duodenal ulcers. Patients receiving the mineral water in addition to basic treatment showed recession of radiological symptoms to a greater extent than patients treated by pharmacological and dietary means only. Apart from single cases of transitory diarrhea, no other side effects were noted. Similar results were achieved with the use of salt tablets. It is recommended that these be used during post-spa treatment at home for reasons of convenience.—Copyright 1974, Biological Abstracts, Inc. W75-05712

A SOCIO-ECONOMIC EVALUATION OF ALTERNATIVE WATER MANAGEMENT POLICIES ON THE RIO GRANDE IN NEW MEXICO, New Mexico State Univ., University Park. Dept. of Agricultural Economics. For primary bibliographic entry see Field 6B. W75-05790

EVALUATION OF POPULATION GROWTH AND PER CAPITA CONSUMPTION OF WATER ON THE REGIONAL ECONOMIC GROWTH IN THE RIO GRANDE REGION IN NEW MEXICO, New Mexico State Univ., University Park. Dept. of Agricultural Economics. For primary bibliographic entry see Field 6B. W75-05791

6E. Water Law and Institutions

DIGEST OF ENERGY FACTS FOR WATER RESOURCES STUDIES IN MINNESOTA, Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 3E.
W75-05352

CONNECTICUT WATER LAW: SUMMARY AND INDEX OF STATUTES, Connecticut Univ., Storrs. Inst. of Water

Resources. R. W. Deitchman.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-239 992, \$4.75 in paper copy, \$2.25 in microfiche. Re-port No 22, October 1974. 83 p. OWRR A-999-CONN(15)

Descriptors: *Water law, *Legislation, *Connecticut, *Water rights, Water resources, Water pollution control, Water quality control,

Identifiers: *Public regulation, Connecticut General Statutes

A list of laws relevant to water resources has been compiled from the Connecticut General Statutes, a series of documents containing the legislative mandates and policies of the state of Connecticut As the Statutes are not readily available nor indexed for easy retrieval, concise abstracts of each of the water-related statutes, coded with the chapter and section number from the General Statutes, have been included. To provide easy access in a preliminary search for specific laws, a subject index, with key words from the statutes, has been devised. Although intended only as a summary of the Connecticut water law statutes, a basic understanding of the water-related policies of the state of Connecticut is provided. (de Lara-Connecticut) W75-05437

UNDERSTANDING THE WATER RESOURCES RESEARCH CENTER, GRADUATE SCHOOL, UNIVERSITY OF MINNESOTA, Minnesota Univ., Minneapolis. Water Resources

Research Center.

w. C. watton. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-240 180, \$4.25 in paper copy, \$2.25 in microfiche. Bul-letin 73, September 1974, 52 p. OWRR A-999-MIN(32).

Descriptors: *Institutions, *Minnesota, *Water Resources Institute, *Universities, Training, *Education, *Research and development, Or-ganizations, Water Resources Research Act.

Information is presented on the origin and history of the Water Resources Research Center of the University of Minnesota. Organizational struc-Omversity of mannesota. Organizational students ture, functions, characteristics, goals, and programs of the Center during the past 10 years are described, and background information is presented concerning water resources programs in Minnesota. W75-05443

TECHNOLOGICAL LIMITATIO GROUND-WATER MANAGEMENT, LIMITATIONS TO Guyton (William F.) and Associates, Houston,

W. F. Guyton.

Presented at Water for Texas Conference, Texas A and M University, College Station, September 19, 1974. 15 p.

Descriptors: Regulation, *Legal aspects, *Management, *Water rights, Regulated flow, Legislation, Planning, Recharge, Well permits, State jurisdiction, *Texas, *Water law. Identifiers: Correlative rights, Absolute owner-

Texas has realized the common stake in good management of ground-water resources and has acquired a reasonably good working knowledge of the various aquifers and their development. In 1904 Texas Supreme Court held that the owner of the land was the absolute owner of the percolating water and could withdraw for use all the percolating water he wanted without regard to the effect ing water ne wanted without regard to the effect on his neighbors, a decision known as the doctrine of absolute ownership. In 1949, Texas passed a local optional groundwater control law under which local underground-water districts can be formed to manage ground-water resources. Three active districts exist now, all on the Texas High Plains and the water is chiefly used for irrigation Even here, however, there has been no effort to regulate the production of the wells directly. This appears to be a shift from the doctrine of absolute ownership to a doctrine of correlative rights, which may be determined by the percentage of land owned over the aquifer. Where the area of land is proportional to water needs as in the case of rural areas where irrigation is the major use of ground-water, the correlative rights approach will work. Where cities use water in amounts basically independent of land area, the correlative rights system would be inappropriate. (Bradbeer-NWWA) W75-05510

WATER QUALITY IN THE GREAT LAKES: A NEW TIMETABLE, For primary bibliographic entry see Field 5G. W75-05694

IMPLEMENTATION OF THE FEDERAL WATER PROJECT RECREATION ACT IN COLORADO. Colorado State Univ., Fort Collins. Dept. of Politi-

cal Science. J. A. Spence.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-240 279. \$7.00 in paper copy, \$2.25 in microfiche. M. A. Thesis, June 1974. 183 p. 1 fig, 13 tab, 11 ref, ap-pend. OWRT A-015-COLO(1).

Descriptors: *Recreation, *Colorado, aspects, Legislation, Cost sharing, Projects. *Colorado, Legal Identifiers: *Federal Water Project Recreation

The implementation of the Federal Water Project Recreation Act in Colorado appears to be fulfilling its congressional mandate. Colorado's experience with the application of P.L. 89-72 is limited, however, because of the time period required for planning, authorizing, and funding water projects planning, authorizing, and funding water projects and by a general adverse public response to the construction of reservoirs. Only a small number of Federal water projects in Colorado have been authorized and none of these projects have reached the stage where the non-Federal funds need to be appropriated. It does appear, however, that the Act will continue to fulfill the expectations of its policyworkers in Colorado despite some of its policymakers in Colorado, despite some problems which could impede its application. W75-05772

WATER SUPPLY, TREATMENT, DISTRIBU-TION, AND REUSE OPTIMIZATION IN ARID URBAN AREAS,

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W75-05773

COMMERCIAL NAVIGATION ON THE UPPER MISSISSIPPI: ECONOMIC AND ENVIRON-MENTAL CHOICES, Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.

R. Christianson

Available from the National Technical Informasvanaore from the National Technical Information Service, Springfield, Va 22161 as PB-240 452, \$3.25 in paper copy, \$2.25 in microfiche. Minnesota Agricultural Economist, Agricultural Extension Service, University of Minnesota. No. 564, February 1975. 6 p, 1 fig. OWRT B-054-MINN(7).

Descriptors: *Navigation, Water policy, *Minnesota, *Mississippi River, Economics, Environment, Legal aspects, Jurisdiction, Inland *Navigation, waterways Identifiers: *Public policy.

Policy choices facing Minnesota and the Upper Midwest regarding low cost water transportation and environmental values are reviewed. Development of the Upper Mississippi River for commer-cial navigation is briefly reviewed from an histori-cal viewpoint. The economic role of the waterway is examined. The two court battles over operation, maintenance, and replacement of navigation development are placed in the context of policy choices facing Minnesota and the Upper Midwest. (Waelti-Minnesota) W75-05788

6G. Ecologic Impact Of Water Development

DIGEST OF ENERGY FACTS FOR WATER RESOURCES STUDIES IN MINNESOTA, Minnesota Univ., Minneapolis. Water Resources For primary bibliographic entry see Field 3E. W75-05352

NUTIS: NUMERICAL AND TEXTUAL INFOR-MATION SYSTEM, VERSION 1.0, - A USERS Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 7C. W75-05390

MEASURING THE SOCIAL ATTITUDES AND AESTHETIC AND ECONOMIC CONSIDERATIONS WHICH INFLUENCE TRANSMISSION LINE ROUTING,
Battelle-Pacific Northwest Labs., Richland,

P. L. Hendrickson, R. W. Bahl, B. A. Gray, and W. S. Maynard.

Available from the National Technical Informa-tion Service, Springfield, Va., 22161, as Rept. No. BNWL-1837. Report BNWL-1837, July 1974. 121 p, 5 fig. 8 tab, 32 ref.

Descriptors: *Attitudes, Social aspects, *Aesthetics, *Nuclear powerplants, *Sites, *Methodology, Technology, *Assessment, Evaluation, Benefits, Economics, Water quality, Public health. Safety. Cultural control. Public health, Safety, Cultural control, Recrea-Identifiers: *Transmission line routing.

The summary report represents an interdisciplinary effort to extend a methodology for siting nuclear power plants to the problem of routing electric power transmission lines. The methodology incorporates both public values and technical analysis included economic, water quality, air quality, animal/plant, cultural/recreational, health and safety, and aesthetics. (Houser-ORNL) W75-05391 assessments. The criteria used in the siting study

NUCLEAR POWER FACILITY PERFORMANCE CHARACTERISTICS FOR MAKING ENVIRONMENTAL IMPACT ASSESSMENTS.

Directorate of Regulatory Standards (AEC),

Washington, D.C.
Available from the National Technical Informarevaluation from the National Technical Informa-tion Service, Springfield, Va. 22161, as Rept No WASH-1355, \$7.60 paper copy, \$2.25 microfiche. Report WASH-1355, December, 1974. 230 p, 4 fig, 9 tab, 26 ref, 3 append.

Descriptors: *Nuclear Powerplants. *Environmental effects, *Assessment, *Evaluation, *Sites, Accidents, Legislation, Legal aspects, Effluents, Radiation, Radioactive waste disposal, Air pollution, Water pollution, Water quality, Damages, Aquatic populations, Ecology, Ecosystems, Land management, Water utilization, Design criteria.

In the past, licenses to operate nuclear power plants have been granted for specific plants located on specific sites. The licensing process has involved the concurrent review of all safety and environmental issues associated with plant siting, design, construction, and operation. For purposes of environmental impact assessment, the required information concerning the facility would include only those characteristics that can affect the site

and its environs. The performance characteristics of nuclear power stations which significantly af-fect the environment are identified in this report. Models used to assess environmental impacts are not specified; however several models are presented or referenced for illustrative purposes. None of these should necessarily be regarded as the recommended approach for simulating a given impact. A set of performance characteristics for a hypothetical nuclear power facility is derived from a composite of design data and expressed numeri-cally as envelopes whose bounds describe existing technology for light-water-cooled nuclear power stations. (Houser-ORNL) W75-05395

A PRELIMINARY INVESTIGATION OF THE EFFECTS OF WATER LEVELS ON VEGETATIVE COMMUNITIES OF LOXAHATCHEE NATIONAL WILDLIFE REFUGE, FLORIDA, Buearu of Sport Fisheries and Wildlife, Atlanta,

W. W. Hagenbuel, R. Thompson, and D. P.

Rodgers.

Available from the National Technical Informa-

tion Serivce as PB-231 611, \$3.25 in paper copy, \$2.25 in microfiche. Ecological Report No DI-SFEP-74-20, February 1974. 29 p. 17 fig, 5 tab, 17

Descriptors: *Water level fluctuations, *Vegetation, *Flooding, *Wildlife conservation, *Water Florida, Water management(Applied), Fish, Distribution, Aquatic plants, Wetlands, Marshes, water storage.
*Loxahatchee

Natl. Refuge(Fla), Everglades(Fla).

Vegetative changes occurring on Loxahatchee National Wildlife Refuge located in the Everglades, in relation to water level fluctuations are shown and the impact of alternate water regimes projected. Results will be used to encourage implementation of a water management program. Goals for this 145,635-acre refuge include providing for maximum populations of wading birds and waterfowl, representative numbers of native wildlife, and increased numbers of endangered and rare species. The basic ground sampling techniques was a five-point sampler to record vegetation across contours of known elevations. The data were related to recorded water conditions at those elevations over time. Vegetative changes were also determined by aerial photographs. Inundation curves for 15 plant species were prepared from data at 2,715 stations. The species were grouped into four distinct communities based on similarities in inundation curves. Sampling data were extrapolated to estimate proportions of the study area occupied by each community and to predict changes that would accompany proposed adjust-ments in the water regulation schedule. Based on the demonstrated relationships between seasonal water level fluctuation and plant community distribution, a 14-to-17 foot (mean sea level) water regulation schedule was superior to the proposed 17-to-15 foot. (Jones-Wisconsin) W75-05737

THE EFFECTS OF PRESCRIBED BURNING ON SAWGRASS, CLADIUM CRANTZ, IN SOUTH FLORIDA, Miami Univ., Coral Gables, Fla. **JAMAICENSE**

C. A. Forthman.

Available from the National Technical Information Service Srpingfield Va, 22161, as PB-231 603, \$4.75 in paper copy, \$2.25 in microfiche. Ecologi-cal Report No DI-SFEP-74-10, June 1973. 93 p, 18 fig, 6 tab, 1 append. 14-10-9-900-355.

Descriptors: *Grasses, *Burning, *Florida, Plant growth, Vegetation regrowth, Plant populations, Nutrients, Phosphates, Grasslands, Potassium,

Identifiers: *Sawgrass, Everglades(Fla), Cladium

Understanding the effects of fire on the sawgrass community is essential to sound management practices for the area. Response of sawgrass to burning under prescribed conditions was studied. Specific attention was given to the rate and character of sawgrass regeneration, changes in species composition in the burned area and nutrient release in the ash of sawgrass fires. The rescribed burn sites, all of which are in the Shark River Slough in the Everglades National Park, an unburned area, also in the park, and a wildfire site. north of the park adjacent to a water impoundment area were surveyed. Sawgrass has several morphological characteristics making it well adapted to withstand fire. The first portions of leaves produced after a fire lack the rigidity of unburned sawgrass. Sawgrass did not reach its preburn height in the first year after burning in sites burned in the fall, but did not reach the pre-burn height in the spring burn. The sites burned in the spring had greater over-all growth rates than either of the sites burned in the fall. Potassium and large amounts of phosphate-phosphorus were released into the water by burning sawgrass. Nitrate-nitrogen also showed a slight increase. (Jones-

WATER MANAGEMENT: THE KEY TO FISH AND WILDLIFE VALUES IN SOUTH FLORIDA, Bureau of Sport Fisheries and Wildlife, Atlanta,

Available from the National Technical Informa-Available from the National Technical Information Service Springfield Va 22161, as PB-231 653, \$ 3.25 in paper copy, \$2.25 in microfiche. Ecological Report No DI-SFEP-74-18, February 1974. 8 p.

Descriptors: *Water management(Applied), *Fish, *Wildlife conservation, *Florida, Environmental effects, Urbanization, Water resources development, Water, Utilization, Water quality, Eutrophication, Water level fluctuations, Estuaries, Water supply, Water storage, Water demand, Runoff, Flooding.

Identifiers: *South Florida, Hydroperiod alteration, Everglades(Fla).

Some probable effects of continued population growth and development in South Florida upon water quality, quantity, and distribution are described. Backpumping, or any other scheme to stack more stored water on the Everglades marshes and to consisitently flood those marshes for abnormally prolonged periods is an undesirable approach to the augmentation of a fresh water supply. Without rigid and enforceable constraints on human population growth, each technological solution to the problem of water supply will stimulate growth that, in turn, will generate the additional demand for more water and more civil works to provide it. Each sucessive episode in this self-nourishing supply-demand cycle will close more water-management options and will destroy more fish and wildlife benefits by superimposing technological over natural systems. Reduction of downstream flow from the major lower east coast canals may adversely influence estuarine salinity regimes downstream from the affected canals. Certain effects of seasonal drying and flooding on Everglades vegetation were explored and defined in order to develop the capacity to predict the changes in vegetation that will probably occur with the new schedule for Conservation Area 1 (Loxahatchee National Wildlife Refuge). (Jones-Wisconsin. W75-05742

STATUS OF COLONIES OF LAND WADING BIRDS IN SOUTH FLORIDA, National Audubon Society, New York. For primary bibliographic entry see Field 4C.

Field 6-WATER RESOURCES PLANNING

Group 6G-Ecologic Impact Of Water Development

THE EFFECTS OF DRAINAGE AND ASSOCIATED DEVELOPMENT IN THE BIG CYPRESS SWAMP, Bureau of Sport Fisheries and Wildlife, Atlanta,

J. P. Crowder.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231-612, \$3.25 paper copy, \$2.25 microfiche. Ecological Report No. DI-SFEP-74-21, February 1974. 9

Descriptors: *Drainage effects, *Land development, *Swamps, *Environmental effects, Florida, Water quality, Wildlife, Fish, Estuaries, Water distribution(Applied), Water supply, Salinity, Estuaries.

Identifiers: *Big Cypress Swamp(Fla), Southwest Florida, Everglades(Fla).

If the Big Cypress Swamp and the northwestern portion of the Everglades National Park are to be portion of the Evergiades National Park are to be protected from damage or destruction, they must be assured of high quality water, adequate in quantity, and properly timed. Any proposals for draining or altering land within the Big Cypress, particularly within the central subarea C, should be scrutinized to anticipate and avert environmental damage. Nutrient overenrichment of waters from agricultural and urban areas is expected to reduce species diversity and ecosystem stability. In-creases in water-borne pesticides are also ex-pected to accompany development and could elevate levels above the present relatively low concentrations in water, soils, and animal tissues in the Big Cypress. Major alterations to surface water flows will disturb the critical periodicity of water delivery to estuarine zones, produce surface water depth fluctuations out of phase with the seasonally heavy feeding requirements of aquatic wading birds, and precipitate massive redistributions of dominant vegatative communities in favor of the less aquatic types. Drainage that causes a pulsing of freshwater flows to sea will intermittently reduce salinity to abnormally low levels in the estuarine zone and will increase the transport of silt and chemical pollutants. (Jones-Wisconsin) W75-05807

7. RESOURCES DATA

7A. Network Design

OPTIMUM DESIGN OF MOUNTAINOUS RA-INGAGE NETWORKS USING BAYESIAN DECI-SION THEORY.

Arizona Univ., Tucson. Dept. of Hydrology and For primary bibliographic entry see Field 2B. W75-05524

RANDOM AND SYSTEMATIC ERRORS IN PRECIPITATION AT AN EXPOSED SITE,
Waikato Valley Authority, Hamilton (New Zealand). For primary bibliographic entry see Field 2B. W75-05845

7B. Data Acquisition

SHIPPING CONTAINER FOR PLUTONIUM-238 AS FISSILE MATERIAL CLASS 1, Los Alamos Scientific Lab., N.M.
For primary bibliographic entry see Field 5G. W75-05364

TECHNIQUES, PROGRESS REPORT, OC-TOBER 1, 1973, THROUGH MARCH 31, 1974, Los Alamos Scientific Lab., N.M. For primary bibliographic enters. W75-05365

ELECTRONIC IDENTIFICATION AND TEM-PERATURE MONITORING, Los Alamos Scientific Lab., N. Mex.

A. Koelle, R. Freyman, S. Depp, and D. Holm. Available from NTIS Springfield Va. as REPT No. LA-5790-PR, \$4.00 in paper copy, \$2.25 in microfiche. Report LA-5790-PR, December 1974.

Descriptors: *Monitoring, *Temperature, *Research and development, *Cattle, *Animal diseases, *Animal pathology, Environmental effects, Biology, Environmental asanitation, Epidemiology, Public health, Economics, Computer programs. Identification.

During fiscal year 1975 the proof of principle of electronic identification and temperature monitor-ing of animals has been established. A preprototype system including two transponders and bat-tery powered readout has been constructed and demonstrated to be capable of transmitting three decimal digits of identification and temperature to 1/10 degree Celsium (C) accuracy to a range of about 7 m (20 ft). Plans are being made to improve the circuitry and to design a national electronic identification and temperature monitoring system with the United States Department of Agriculture (USDA). The system appears to have other applications for identifying and monitoring highly valued items. (Houser-ORNL) W75-05381

TELEMETRY IN WATER POLLUTION CON-

TROL, South Yorkshire Metropolitan Country Council For primary bibliographic entry see Field 5D. W75-05397

PROCEDURE FOR PLACING LARGE UNDIS-TRUBED MONOLITHS IN LYSIMETERS. Texas A and M Univ., College Station. Dept. of

Soil and Crop Sciences. For primary bibliographic entry see Field 2G. W75-05517

ANALYSIS OF GROUND-WATER REGIMES BY USE OF NATURAL URANIUM ISOTOPE VARIATIONS, Florida State Univ., Tallahassee. Dept. of Geolo-

For primary bibliographic entry see Field 2F. W75-05535

PROBLEMS WITH THE USE OF CASCADE IM-PACTORS, Maryland Univ., College Park. Dept. of Chemis-

For primary bibliographic entry see Field 5A. W75-05574

INDUSTRIAL SOURCE SAMPLING FOR TRACE METALS, Purdue Univ., Lafavette, Ind.

For primary bibliographic entry see Field 5A. W75-05575

January 1972.

MICRO-TOPOGRAPHIC PROFILE GAGE. Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station W. R. Curtis, and W. D. Cole.
Agricultural Engineering, Vol 53, No 1, p 17,

Descriptors: *Strip mines, *Bank erosion, *Soil profiles, *Topography, *Gages, Data collection, Films, Analytical techniques, Appalachian Moun-

Knowledge of erosion and subsequent siltation is basic to the development of adequate control practices. A profile gage was developed that allows rapid determinations of changes along a four-foot profile. Data are recorded on film for later tabulation and compilation. (Forest Service) W75-05599

A THEORETICAL STUDY ON THE IN-TERPRETATION OF RESISTIVITY SOUNDING DATA MEASURED BY THE WENNER ELEC-TRODE SYSTEM, Missouri Univ., Rolla. Dept. of Geophysical En-

gineering. For primary bibliographic entry see Field 8G. W75-05618

STREAM GAGING BY CONTINUOUS INJEC-TION OF TRACER ELEMENTS, Arizona Univ., Tuscon. Graduate Committe on Hydrology.

For primary bibliographic entry see Field 2E. W75-05619

THE MEASUREMENT OF VERTICAL STRAIN IN GLACIER BORE HOLES, Alaska Univ., College. Geophysical Inst. J. C. Rogers, and E. R. LaChapelle. Journal of Glaciology, Vol 13, No 68, p 315-319, 1974. 4 fig. NSF GA 28544.

*Strain measurement, Descriptors: *Boreholes, *Instrumentation, Glaciers, Glaciology, Drill holes, Exploration, Measurement, Data collections, Snow cover.

A method to measure the vertical strain in glacier bore holes was described that entailed placement of passive markers at varying depths. The position these markers with respect to a surface reference was measured by an electronic sensor lowered into the hole. These measurements can be combined with inclinometer measurements to yield the total velocity vector in the ice surround-ing the hole. Although the method was designed for use in a 0.05 m diameter hole, it can easily be applied to holes of different diameters and to winter snow covers as well as glacier ice. (Humphreys-ISWS) W75-05674

AN APPLICATION OF INFRARED REMOTE SENSING TECHNIQUES TO ECOLOGICAL PROBLEMS,

Force Avionics Lab., Wright-Patterson, (AFB), Ohio.

L. W. Crouch, and R. D. Mower. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as AD786 028, \$3.75 in paper copy, \$2.25 in microfiche. Technical Report 74-98, July 1974. 40 p, 24 fig.

Descriptors: *Remote sensing, *Infrared radia-tion, *Thermal pollution, Water temperature, *Ecology, Discharge(Water), Effluents, At-mosphere, Attenuation, Meteorology, Solar radia-tion, Laboratory tests, Photography, Temperature

gradients. Identifiers: *Infrared imagery.

A compendium of aerial infrared imagery was extracted from a research and development laboratory test of an Air Force infrared scanner. The purpose of the test was to demonstrate the ability of one Air Force scanner to display thermal dif-ferentials found in a ground scene. The flight test area included a series of waterways and contiguous shorelines that illustrate ecology thermal phenomena. Specific examples of imagery were extracted from the test program data. A summary of pertinent infrared technology was presented which relates sensor performance to atmospheric conditions, target and background characteristics. as well as image information content. In addition, brief photographic interpretation comments were included for each infrared image. (Sims-ISWS) W75-05679 USE OF REMOTE SENSING FOR VEGETA-TION INVENTORIES IN A DESERT SHRUB COMMUNITY,

Arizona Univ., Tucson. Dept. of Watershed Management.

E. B. Fish, and E. L. Smith.

Progressive Agriculture in Arizona, Vol 25, No 3, p 3-5, May-June, 1973. 4 fig, 4 tab, 2 ref.

Descriptors: *Aerial photography, *Desert plants, *On-site data collections, *Remote sensing, *Surveys, *Arizona, Data collections, Regional analysis, Sampling, Vegetation, Cacti, Costs, Equipment, Films, Instrumentation, Land use, Long-term planning, Satellites(Artificial), Shrubs. Identifiers: *ERTS, Imagery, Pima County(Ariz), Santa Rita Experimental Range.

The feasibility of using remote sensing techniques to sample desert vegetation as an aid to land-use planners to rapidly, accurately, and economically inventory extensive areas of natural ecosystems is examined. The test site, a mesquite-paloverde community located on the Santa Rita Experimencommunity located on the Santa Rita Experimen-tal Range in Pima County, Arizona, at an elevation of about 3200 ft, was delineated using complete stereo coverage at a scale of 1:6000 (approximately 10 in per mi) with black and white panchromatic and with Ektachrome color infrared film. Sampling of two subcommunities, using a scale of 1:6000 (approximately 1 in per 50 ft) with multiseasonal, color infrared photographes, permitted identification of the major shrubs and cacti. Individual plants of many species could be seen in this scale though not accurately identified because of size. Ground truth samples were also made, and a comparison of the two techniques indicated that significant cover differences for staghorn cholla and hackberry remained undetected by imagery sampling. In general, however, the imagery techniques, using approximately one-third as many samples, detected crown cover differences nearly as well as more intensive ground sampling. Remote sensing imagery was thus concluded to be advantageous for vegetation inventories because it affords increased access to sampling area, a reduc-tion of labor and costs (10 man days, 5 round trips for ground sampling in contrast to 3 mean days, 2 hrs flying time, and 100 ft of film for imagery sampling), and yields a permanent visual record for conditions at a specific time. (Gloyd-Arizona) W75-05721

REMOTE SENSING AS A VEGETATION MAPPING TOOL IN THE PROPOSED CHARLESTON DAM SITE AREA,

Arizona Univ., Tucson. Office of Arid Lands Studies.

K. E. Foster, B. Musick, and P. R. Ogden. Progressive Agriculture in Arizona, Vol 25, No 3, p 6-9, May-June, 1973. 8 fig, 1 tab, 1 ref.

Descriptors: *Aerial photography, *Arizona, *Deserts, *Mapping, *Regional analysis, *Remote sensing, Sierozems, Topography, Vegetation, Correlation analysis, Data collections, Desert plants, Instrumentation, Satellites(Artificial), Surveys.

veys. Identifiers: *Charleston Dam Site(Ariz), Chihauhuan Desert, Cochise County, San Pedro Valley, *ERTS.

ERTS (Earth Resources Technology Satellite) multi-spectral imagery was used with high-altitude color infrared color photography to make a multi-level vegetational survey of the proposed Charleston Dam Site area in the San Pedro Valley, Chochise County, Arizona. The area, covering approximately 120,000 acres located within the Chihauhuan Desert, is a predominantly desert scrub community. Vegetation boundaries were delineated by high-altitude color infrared photography, an initial vegetation map developed in the laboratory, and 11 vegetation classifications were derived therefrom. Using color variations of soil surface, vegetation and topography, whitethorn (Acacia vernicosa), tarbush (Flourensia cenua),

and creosotebush (Larrea tridentata) were noted as the dominant species. From an altitude of 570 mi the study area was imaged through multiband ERTS imagery, and a technique using the same surface color variations of the soil, topography, and vegetation permitted the derivation of broad vegetation boundaries. ERTS may serve an important role as a regional information source since the large area encompassed by one ERTS photograph makes it an excellent data-collection instrument. Aircraft and satellite photography permit detailed mapping of vast areas quickly, though in a desert region great reliance on soil, topography and vegetation correlations is necessary. When high-altitude photography is used, detailed mapping of small objects (3 m in diameter) may be achieved by the excellent resolution. ERTS on the other hand, with a resolution element of approximately 100 m, results in a loss of some information. (Gloyd-Arizona)

SIMULTANEOUS AND AUTOMATED DETER-MINATION OF TOTAL PHOSPHORUS AND TOTAL KJELDAHL NITROGEN,

National Environmental Research Center, Cincinnati, Ohio.

For primary bibliographic entry see Field 5A. W75-05756

TECHNIQUES FOR DETERMINING AMOUNTS AND DISTRIBUTION OF PRECIPITATION IN MOUNTAIN VALLEYS OF IDAHO, Idaho Univ., Moscow. Water Resources Research Inst.

For primary bibliographic entry see Field 2B. W75-05783

AUTOMATIC WATER SAMPLER, For primary bibliographic entry see Field 5A. W75-05822

METHOD AND APPARATUS FOR MONITOR-ING POLLUTION OF NATURAL WATERS, Environmental Research Inst. of Michigan, Ann Arbor. (assignee) For primary bibliographic entry see Field 5A. W75-0582.

THE ESTIMATION OF SOIL MOISTURE DEFICITS BY PENMAN'S AND THORNTHWAITE'S METHOD IN MID CANTERBURY.

Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station. For primary bibliographic entry see Field 2D. W75-05831

USE OF TIME-LAPSE PHOTOGRAPHY TO ASSESS POTENTIAL INTERCEPTION IN ARIZONA PONDEROSA PINE, Arizona Univ., Tucson. Dept. of Watershed Management. For primary bibliographic entry see Field 2C.

W75-05834

A SAMPLER FOR TAKING SOIL SAMPLES FROM SPECIFIC SOIL ZONES, North Carolina State Univ., Raleigh. Dept. of Soil

Science, Vol 118, No 6, p 402-404, December

1974. I fig. 1 tab.

Descriptors: *Sampling, *Agronomy, Soil analysis *Eastility *Equipment Eastilization Soil in

Descriptors: *Sampling, *Agronomy, Soil analysis, *Fertility, *Equipment, Fertilization, Soil investigations, Soil surveys, Fertilizers, Research equipment, Soil contamination, Soils. Identifiers: *Samplers.

A soil sampler was developed which can be used to take a sample from a specific depth zone without contamination occurring from adjacent zones. A sampling experiment compared the sampling characteristics of conventional tube and auger samplers with the new sampler. Samples were taken from a zone less than I inch below a fertilized zone without appreciable contamination from the fertilized zone. The superiority of the new sampler was evident. The sampler was recommended for use in field studies where the exact location of fertilizer elements in the soil profile is desired. (Sanderson-ISWS)

COMBINED USE OF SATELLITE, RADAR, AND AEROSYNOPTIC INFORMATION FOR FORECASTING HEAVY PRECIPITATION, TAKING THE SNOWFALL OF OCTOBER 14-16, 1971, IN THE CENTRAL REGION OF THE EUROPEAN USSR AS AN EXAMPLE, FOR primary bibliographic entry see Field 2B. W75-05841

LIMITATIONS OF THE INSTANTANEOUS PROFILE METHOD FOR FIELD MEASUREMENT OF UNSATURATED HYDRAULIC CONDUCTIVITY,

Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 2G. W75-05843

RADIOMETRIC MEASUREMENTS OF STRATOSPHERIC WATER VAPOR IN THE SOUTHERN HEMISPHERE, Commonwealth Scientific and Industrial Research

Organization, Aspendale (Australia). Div. of Atmospheric Physics. For primary bibliographic entry see Field 2B. W75.0844

7C. Evaluation, Processing and Publication

A COMPUTERIZED MODEL FOR DETERMINING THE OPTIMAL WATER UTILIZATION FOR AGRICULTURE,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W75-05356

ELECTRONIC IDENTIFICATION AND TEM-PERATURE MONITORING, Los Alamos Scientific Lab., N. Mex. For primary bibliographic entry see Field 7B. W75-05381

ANNUAL REPORT ON PROJECT ANO115A, FISCAL YEAR 1974, Argonne National Lab., Ill. For primary bibliographic entry see Field 5B. W75-05382

NUTIS: NUMERICAL AND TEXTUAL INFOR-MATION SYSTEM, VERSION 1.0, - A USERS MANUAL,

Oak Ridge National Lab., Tenn.
R. H. Strand, and D. G. Taylor.
Available from NTIS, Springfield Va. as REPT.
No. EDFB-IBP 74-10, \$4.00 in paper copy, \$2.25 in
microfiche. Report EDFB-IBP 74-10, October
1974. 27 p.

Descriptors: *System analysis, *Ecosystems, *Data collections, *Information exchange, *Information retrieval, Documentation, Publications, Computer program, Data processing, Data storage and retrieval, Programming languages.

Field 7—RESOURCES DATA

Group 7C-Evaluation, Processing and Publication

Numerical and Textual Information System (NUTIS) is a data-management tool for handling of information. One objective in the International Biological Program was the development of in-tegrated and automated information handling procedures for numeric data from comprehensive procedures for numeric data from comprehensive total ecosystem analyses. The design of the Numerical and Textual Information System (NUTIS) was centered on this objective. NUTIS was developed upon the following criteria: (1) to design a system for storing, cataloging and retrieving numerical data sets; (2) to provide a versatile system which would be easy to learn to use; (3) to make a compromise between efficiency and portability to other installations; (4) to allow efficient updating and improvement by implementation in a modular and improvement by implementation in a modular form; (5) to protect against adulteration of the data by controlling user access; and (6) to satisfy the basic requirements with a minimum of time and money. (Houser-ORNL)
W75-05390

THE ENVIRONMENTAL FLOW OF CADMIUM

AND OTHER TRACE METALS: VOLUME II, Purdue Univ., Lafayette, Ind. K. J. Yost, V. L. Anderson, J. E. Christian, W. J. Davis, and W. V. Kessler.

Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-229 479, \$7.00 in paper copy, \$2.25 in microfiche. Progress Report, July 1, 1972 to June 30, 1973. 189 p, 66 fig, 20 tab.

Descriptors: "Path of pollutants, "Cadmium, "Trace elements, "Heavy metals, "Industrial wastes, Zinc, Lead, Water pollution, Industrial plants, Model studies, Analytical techniques, Rural areas, Graphical analysis, Instrumentation, Laboratory equipment, Statistical methods.

The project was composed of two basic components; (a) collaborative research with industrial and waste processing facilities whose process streams contain significant amounts of cadmium. zinc, lead and other heavy metals, and (b) environmental studies to identify translocation mechanisms, distribution and fate of cadmium, lead and zinc in the urbanized, heavily industrial-ized Chicago-East, Chicago-Gary area bordering the southern rim of Lake Michigan. The objectives for the first year of the present study with respect to (a) were to identify, enlist the cooperation of, and initiate sampling programs in pertinent industrial and waste processing facilities. Objectives for component (b) were to scope metal contamination in the Chicago-East Chicago-Gary study area and to choose specific ecosystems and metal transport mechanisms for subsequent, more intensive study. Volume II included reports on (1) modeling and logistics (modeling cadmium discharge from an electroplating line, an air transport model, analysis of cadmium paths in zinc smelter operations, and a preliminary version of a rural ecosystem model); (2) statistical aspects of the experimental design and data analysis; (3) a description of the analyti-cal laboratory; (4) a graphical technique for identi-fying stable cadmium compounds; and (5) a brief description and list of speakers and attendees at the Purdue - ILZRO cadmium conference. (See also W75-05431) (Pulliam-Vanderbilt) W75-05432

GROUND WATER ACTIVITIES IN THE USGS, Geological Survey, Washington, D.C. Ground Water Branch. For primary bibliographic entry see Field 4B. W75-05503

GROUNDWATER MODELS FOR TEXAS, Texas Water Development Board, Austin. For primary bibliographic entry see Field 2F. W75-05508

A NUMERICAL TECHNIQUE FOR AQUIFER EVALUATION, Illinois Univ., Urbana. Dept. of Geology. For primary bibliographic entry see Field 2F. W75-05612

DIGITAL SIMULATION OF A STREAM-

AQUIFER SYSTEM, Illinois Univ., Urbana. Dept. of Geology. For primary bibliographic entry see Field 2F. W75-05620

EFFECT OF CO2 ON THE CHEMICAL EQUIL-LIBRIUM OF SOIL SOLUTION AND GROUND

Arizona Univ., Tuscon. Dept. of Hydrology. For primary bibliographic entry see Field 2G. W75-05623

ADJUSTMENT OF LOGARITHMIC FLOOD-FREQUENCY STATISTICS FOR GAGED CALIFORNIA STREAMS TO MINIMIZE THE TIME SAMPLING ERROR, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 4A.

WATER-QUALITY DATA OF THE SACRA-MENTO RIVER, CALIFORNIA, MAY 1972 TO APRIL 1973, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 5A. W75-05635

SUMMARY OF MULTISPECTRAL FLOOD IN-UNDATION MAPPING IN IOWA, Iowa State Geological Survey, Iowa City. B. E. Hoyer, G. R. Hallberg, and J. V. Taranik. Public Information Circular No 7, September 1974. 57 p, 6 fig, 3 tab, 9 ref.

Descriptors: *Floods, *Iowa, *Mapping, *Remote sensing, Flood data, Satellites(Artificial), Aerial photography, Infrared radiation. Identifiers: *ERTS.

Multispectral imagery from three floods occurring at different times of year in Iowa was used to develop methods of mapping flood inundation several days after flood waters have returned to the main channel of rivers. Color infrared film pro-vides flood inundation data for floodplain management planning. Winter floods may be mapped by identifying ice remaining after flood recession. Evaluation of multispectral imagery from midspring floods indicates that significant flooding may be mapped for at least 5 days following flood recessing. Late summer floods may be mapped for at least 7 days following flood crest using color-infrared imagery. Best flood inundation mapping was accomplished by multispectral color-additive viewing utilizing the blue and infrared bands. ERTS-1 satellite data supported the basic conclusions of the low-altitude studies and extended the time for acquisition of infrared imagery in late summer. The satellite imagery also allowed rapid appraisal of the areal extent of flood inundation on a regional scale. (Knapp-USGS) ment planning. Winter floods may be mapped by

GROUND-WATER RESOURCES OF GRIMES COUNTY, TEXAS.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W75-05641

ANALOG-MODEL STUDIES OF GROUND-WATER HYDROLOGY IN THE HOUSTON DIS-Geological Survey, Austin, Tex. For primary bibliographic entry see Field 4B. W75-05642

LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON REGION, TEXAS, Geological Survey, Houston, Tex. For primary bibliographic entry see Field 4B. W75-05643

DERIVATION OF HOMOGENEOUS STREAM-FLOW RECORDS IN THE UPPER KENTUCKY RIVER BASIN, SOUTHEASTERN KENTUCKY, Geological Survey, Louisville, Ky. For primary bibliographic entry see Field 2E. W75-05644

LAKES MARION-MOULTRIE STREAM SYSTEM INVESTIGATION: PART I--MODEL SELECTION, CALIBRATION, AND ERROR ANALYSIS, Geological Survey, Columbia, S.C. For primary bibliographic entry see Field 2E. W75-05646

APPLICATION OF STATISTICAL TECHNIQUES TO THE ESTIMATION OF GROUND-WATER WITHDRAWALS NORTHWESTERN KANSAS, Geological Survey, Lawrence, Kans. For primary bibliographic entry see Field 4B. W75-05651

STOCHASTIC MODELING OF THE PASSAIC RIVER FLOW Rutgers - the State Univ., New Brunswick, N.J. Rutgers - the State Univ., New Brunswick, N.J. Dept. of Chemical Engineering; and Rutgers - the State Univ., New Brunswick, N.J. Dept. of Biochemical Engineering. For primary bibliographic entry see Field 2E. W75-05660

MARINE ATLAS OF HAWAII: BAYS AND HAR-

BORS. Hawaii Univ., Honolulu. Sea Grant Program. Hawaii Univ., Honolulu. Sea Grant Program.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-7411451, \$8.50 in paper copy, \$2.25 in microfiche.
Sea Grant Miscellaneous Report UNIHISEAGRANT-MR-74-01, January 1974. 241 p, 61
fig, 179 ref, 10 append. Grace, J.M., editor. Sea
Grant 04-3-158-29.

Descriptors: *Maps, *Hawaii, *Bays, *Harbors, Data collections, Economics, Geology, Water resources, Weather, Temperature, Precipitation(Atmospheric), Humidity, Geographical regions, Islands, Estuaries, Wildlife, Aquatic life, Oceans, Coasts, Social aspects, Winds, Tsunamis, Identifiers: *Hawaiian archipelago.

Knowledge available prior to August 1972 was provided about bays and harbors of Hawaii and basic information needed by government provided about bays and narbors of Hawaii and basic information needed by government, scientists, and members of industry for planning, research, and development. Subjects discussed for the Hawaiian Archipelago and each county in-cluded culture and society, economy, geography, flora and fauna, geology and water resources, weather, the ocean, coasts, ports, and harbors. (Humphreys-ISWS) W75-05665

A FORTRAN IV COMPUTER PROGRAM TO TABULATE AND GRAPH MICRO-CLIMATIC

DATA, Illinois Univ., Urbana. Dept. of Forestry. D. T. Bell, and S. G. Pallardy.
Transactions of the Illinois State Academy of Science, Vol 67, No 2, p 166-174, June 1974. 4 fig, 2 ref, 1 append. Army DACW-23-73-C 0020.

Descriptors: *Computer programs, *Data processing, *Climatic data, Computers, Programming languages. Identifiers: *FORTRAN IV.

A computer program was described which facilitates the tabulation and presentation in graphic form of the micro-climatic parameters of temperature, relative humidity, solar radiation, and precipitation. The computer program is writ-ten in FORTRAN IV language for the University of Illinois IBM 360/75 computer and uses the Cal-Comp Model 763 Digital Incremental Plotter. Parts requirements and needs. The complete program was given in the appendix. (Humphreys-ISWS) W75-05671 of the program can be modified to meet special

AND CONVERSIONS FOR

MICROCLIMATOLOGY,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station. J. M. Brown.

General Technical Report NC-8, 1973. 31 p, 10 fig, 11 tab, 6 ref.

Descriptors: *Meteorology, *Microclimatology, *Climatology, *Meteorogical data, *Climatic data, Equations, Charts, Solar radiation, Thermal radiation, Hygrometry.

Identifiers: *Conversion factors, Radiant energy

A series of tables, charts, and conversion factors have been prepared for use in microclimatic and ecological studies. Included are: the solution to various equations of radiant energy exchange; solar radiation diagrams; psychometric and precipitation data; and unit conversion factors. (Forest Service) W75-05717

PROBABILISTIC MODEL RARE HYDROLOGIC EVENTS,

Arizona Univ., Tucson. Dept. of Watershed For primary bibliographic entry see Field 2A. W75-05766

8. ENGINEERING WORKS

8A. Structures

REVIEW OF THE ENGINEERING ASPECTS OF POWER PLANT DISCHARGES, Hydronautics, Inc., Laurel, Md. For primary bibliographic entry see Field 5B.

DRAINAGE PLANS WITH ENVIRONMENTAL BENEFITS.

Poertner (Herbert G.), Bolingbrook, Ill.

H. G. Poertner. Landscape Architecture, Vol 64, No 5, p 391-393, October 1974. 1 fig. Owrt C-3380 (no. 3722(2)) Dept. Interior No. 14-31-0001-3722.

Descriptors: *Detention reservoirs, *Flood control, *Urban runoff, *Drainage systems, *Multiple-purpose reservoirs, *Environmental effects, Aesthetics, Storm drains, Planning, Storage, Drainage engineering, Storm runoff, Flow control, Peak discharge, Storm water, Urbanization, Drainage programs, Drainage practices. Identifiers: Environmental benefits.

Three land developments incorporating urban stormwater detention facilities are described. Each has been designed to provide multiple-purpose uses and aesthetic enhancement in addition to the primary objective of peak runoff flow reduction. One of these is a new town, Earth City, under development in the Missouri River Bottoms near St. Louis, Missouri. Flood protection is provided by a levee. Providing for drainage of stormwater without providing storage was found to be uneconomical because of the large facilities required to handle peak flows. Several plans for detention storage were studied and a system of interconnected, oblong finger lakes having a total area of 51 acres was selected. Besides providing for storage of stormwater runoff, the lakes will enhance the esthetics of the community and serve for boating, fishing and passive recreation. The use of rooftops, pedestrian arcades and plazas for stormwater detention in the Skyline Urban Renewal Project in Denver is described. Also described is the Melvina Ditch Detention Reserdescribed is the Meivina Ditch Detention Reservoir constructed by the Metropolitan Sanitary District of Greater Chicago to serve both recreation purposes and local flooding. The author concludes that stormwater detention facilities can often be provided with appreciable costs savings over conventional drainage systems--and that, aesthetics and recreational opportunities can sometimes be added at little additional cost. (Poertner)

THE RISE OF POROUS PAVING.

American Society of Landscape Architects, Louisville, Ky. Landscape Architecture, Vol 64, No 5, p 385-387, October 1974. 3 fig.

Descriptors: *Asphaltic concrete, *Induced infiltration, *Paving, *Storm runoff, *Drainage systems, *Surface drainage, Concrete construction, Drainage engineering, Engineering design, Surface runoff, Sheet flow, Storage, Groundwater recharge, Flood control, Storm drains. Identifiers: *Parking lots, *Vehicle parking areas,

*Porous asphalt.

Applications are described of the use of porous asphalt paving and special latticed concrete paving blocks for use on vehicle parking areas. The open structure of the surfacing material permits the in-flow of stormwater into the base material and subsequent infiltration into the subgrade. The purpose is to reduce peak runoff rates resulting from precipitation. Such measures can reduce urban flooding and the surcharging of storm drainage systems serving such parking areas. Recent new developments of special paving blocks are beginning to have an impact on landscape design. Varieties of porous pre-cast concrete paving block with perforations have long been used in Europe. The parking lot at the Stuttgart, Germany interna-tional exhibition grounds is 'paved' in these per-forated blocks. The use of porous asphalt paving on a parking lot at the University of Delaware, Newark, and at the new town of Woodlands, Texas has been given special recognition and publicity. Porous asphalt is similar to convention asphalt mixes, except that no fine aggregate used in the mix and a slightly higher asphalt content is specified, about 51/2 to 6% by weight. Experience to date has not revealed any problems not experienced by usual asphalt pavements. The physical nature of the subgrade should first be studied to help determine what design is suitable for removal of collected water from the base course. (Poertner) W75-05423

HYDROLOGICAL BALANCING ACT ON A TEXAS NEW TOWN SITE.
American Society of Landscape Architects Louisville, Ky.
Landscape Architecture, Vol 64, No 5, p 394-395, October 1974. 3 fig.

Descriptors: *Storage, *Drainage engineering, *Urban runoff, *Ponding, *Hydrologic equation, Flood control, Storm runoff, Surface runoff, Runoff, Equilibrium, Texas, Urbanization, Planning, Detention reservoirs, Regimen, Environment, Drainage systems, Controlled drainage. Identifiers: *New town, *Woodlands(Texas).

The new town of Woodlands, Texas is being con-structed on a flat and difficult 18,000 acre site, chiefly pine-oak forest, near Houston. One-third of the site is within the 100-year floodplain of three major creeks; and poorly drained soils cover much of the project. The crucial issue then was how to preserve the woodland environment while draining the land for human habitation. It became evident that the natural balance of the hydrologic regimen was the key to successful environmental planning and an organizing concept for development. In order to understand the quantitative aspects of water occurrence, distribution and movement on the site, it was necessary to evaluate solutions of the equation of hydrologic balance or equilibrium. This equation is expressed most simply as: inflowoutflow = plus or minus change in storage. The drainage system designed utilizes the properties of soils, vegetation, and the hydrologic system to drain the site and store runoff during storms. Existing swales, the excess storage capacity of existing ponds and of permeable soils are exploited to: reduce runoff, prevent erosion and siltation, protect natural vegetation, minimize cost, promote recharge, protect wildlife habitats, increase base flow in streams, maintain water quality, enhance scenic amenity, and reduce maintenance. The estimated costs of the 'natural' drainage system being constructed is \$4.2 million. Savings were \$14.5 million. (Poertner) W75-05424

PONDING AGAINST THE STORM, Obrist, (Alfred), Syracuse, N.Y.

A. Obrist.

Landscape Architecture, Vol 64, No 5, p 388-390, October 1974. 6 fig.

Descriptors: *Storage, *Storm runoff, *Drainage systems, *Drainage engineering, *Detention reservoirs, *Ponding, New York, Storm drains, Flood control, Sewers, Application methods, Urban ru-noff, Surface runoff, Runoff. Identifiers: Syracuse(New York).

Three examples of stormwater detention facilities are described. At the Community General Hospital in suburban Syracuse, New York, the natural stormwater runoff route had been blocked by an athletic field and high school. A detention pond having a storage capacity of 202,000 cubic feet was constructed by damming a narrow ravine, using site materials. An emergency spillway was also provided. The maximum impoundment is eight feet. However, since esthetic considerations were important, a minimum water level is retained in the pond at all times. Seeding, planting of the slopes, and retaining all the existing vegetative cover possible were prime design concepts. At Adiron-dack High School an .82-acre pond retains the peak flow of storm waters before they reach an ad-joining stream. The existing high water table keeps the pond filled to its normal level. Excayated earth from the pond was used to raise the level of the athletic fields above flood level of the adjacent stream. Thus, the pond solved a storm water problem and also provides students with an opportunity for nature study, ice skating in winter and visual enhancement. Loretto Rest Geriatrics Center is located on a sloping plateau bonded on the west by a steep hillside with residential proper-ties below. To correct sewer backups from storm-water, a ponding basin of 12,000 cubic feet capaci-ty was built. Design was based on 25-year rainfall frequency. (Poertner) W75-05425

SMOOTHER WATERS FOR THE NEXT 110,000, Northampton Development Corp. (England). R. J. W. Smith

Landscape Architecture, Vol 64, No 5, p 382-384, October 1974. 4 fig.

Descriptors: *Detention reservoirs, *Urban ru-noff, *Storage, *Drainage systems, *Landscaping, Storm runoff, Land forming, Land development, Multiple-purpose reservoirs, Urbanization, Flood control, Drainage engineering, Aesthetics. Identifiers: England.

Field 8-ENGINEERING WORKS

Group 8A-Structures

The use of man-made lakes to detain stormwater runoff in an urbanizing area of a historic town in England is described. The town, midway between London and Birmingham is expected to increase in population by 110,000 during the 13-year period, 1968-1981. The Welland and Nene River Authority stipulated that the flow of Billing Brook through the site of a major new housing development should not be more than 11,640 litres per second. In order to achieve this, three balancing lakes were constructed along the length of Billing Brook to catch stormwater runoff from roads and roofs. This flows into the stream and lakes via gasoline interceptors, which prevent pollution by floating off and segregating oil and gasoline wastes. The alternative would have been colverts which although similar in cost could not provide the amenity values of lakes and open water. Although the flood-control system alone is not unique, the extent of landscape design and provision of amenities-plus flood control is unusual. The construction of the banks was either shingle beach or Malayan Kerume revetment. In order to provide a more suitable habitat for fish the centers were deepened, their clay bottoms not requiring lining. Footpaths around the lakes are linked to other facilities, such as schools and shops. (Poertner) W75-05427

EVALUATION OF FLOOD PEAK PREDICTION METHODS IN NORTHERN NEVADA IN RELA-TION TO DAM SAFETY,

Nevada Univ., Reno. Desert Research Inst. For primary bibliographic entry see Field 8B. W75-05468

DIAMOND DRILLING TERMS AND EQUIP-MENT STANDARDS.

Dresser Industries, Inc., Dallas, Tex. Mining Services and Equipment Div. (1974). 32 p. 5 tab.

Descriptors: *Drilling equipment, *Core drilling, *Drill holes, Operation and maintenance, Boreholes, Well casings, Construction materials, Instrumentation, Specifications, Technology, Industries. Documentation.

Identifiers: Corebarrel, Hole, Rod, Casing, Size, *Glossary, *Drill terminology.

Development of diamond drilling equipment stan dards for industry was a joint effort between the Canadian Diamond Drilling Association, the Diamond Core Drill Manufacturers Association of the U.S.A. and the British Standards Institution of Great Britain and was backed by the Australian Diamond Drilling Association and the South African Core Drilling Association, The basic requirements for diamond drilling such as hole, rod, casing and conventional corebarrel sizes are identical for all the international organizations involved but localizations occur in geologically and economically different areas. The four conventional corebarrel designs, WT, WM, WF and WG, are explained and tables of nomenclature for corebarrels are included. Tables also present specific data on the decided upon parameters for drill rods and casings, corebarrels, bits and reaming shells. A glossary of over 700 terms used in diamond drilling is included. (Bradbeer-NWWA) W75-05516

FLOOD FREQUENCIES AND BRIDGE AND CULVERT SIZES FOR FORESTED MOUNTAINS OF NORTH CAROLINA. Forest Service (USDA), Franklin, N.C. Coweeta

Hydrologic Lab.
For primary bibliographic entry see Field 2E.

8B. Hydraulics

THE THREE DIMENSIONAL HEATED SUR-FACE JET IN A CROSS FLOW, Johns Hopkins Univ., Baltimore. Chesapeake Bay

For primary bibliographic entry see Field 5B. W75-05360

EXPERIMENTAL MEASUREMENTS OF PARTICLE MOTION IN A TURBULENT PIPE FLOW

Illinois Univ., Urbana. Dept. of Nuclear Engineer-

N. M. Howard.

Inst.

N. M. Howard.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 993, \$7.25 in paper copy; \$2.25 in microfiche. PhD thesis, 1974. 202 p. 88 fig. 16 tab, 40 ref., 3 append. OWRT B-067-ILL(1). 14-31-0001-3582.

Descriptors: *Dispersion, Turbulence, Sedimenta-tion, *Pipe flow, *Reynolds number, Measure-ment, *Turbulent flow, Particle size, Data processing, Correlation analysis. Identifiers: *Particle transport(Pipes).

An experimental study of the motion of single spherical particles in turbulent pipe flow at 50,000 Reynolds number has been conducted. The study consisted of four basic parts: (1) The extension of present particle theory valid for homogeneous flow into the realm of nonhomogeneous pipe flow by allowing the fluid convected time scale to exhibit radial dependence; (2) Measurements of twopoint space-time correlations in the pipe to deter-mine the fluid convected frame time macroscale, which is used as an input to the theory and to evaluate the axial spatial macroscale both of which showed the same dependence on radius; (3) Experimental measurements of particle trajectories in the turbulent pipe flow parameterizing on particle size from 2 mm to 6.5 mm diameter and density, from heavier to lighter than fluid values, and (4) An evaluation of the errors involved in the experimental procedure and methods of data processing and smoothing considering both statistical variation and electronic noise.

EVALUATION OF FLOOD PEAK PREDICTION METHODS IN NORTHERN NEVADA IN RELA-TION TO DAM SAFETY,

Nevada Univ., Reno. Desert Research Inst. A. B. Cunningham.

A. D. Cunningnam.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 995, \$3.75 in paper copy; \$2.25 in microfiche. Project Report No 29, January 1975. 41 p, 3 fig. 9 tab, 12 ref. 2 append. OWRT A-055-NEV(1), 14-31-0001-4038

Descriptors: *Dam design, Safety, *Spillways, *Flood frequency, *Nevada, Watersheds(Basins), *Flood peak, *Forecasting, Regional analysis, *Distribution patterns, *Probability, Hydrologic data, Evaluation. Identifiers: Sierra Nevada(Nev), *Dam safety.

Commonly used methods of flood peak prediction were analyzed for 24 Nevada Watersheds Commonly used methods of flood peak prediction were analyzed for 24 Nevada Watersheds representing a wide spectrum of hydrologic, climatic, and geologic conditions. The primary objective was to compare predicted flood peak values with historic flood peak sequences in order to establish guidelines for application of the various prediction methods in the design of dam spillways and other hydralic structures in Newada. and other hydraulic structures in Nevada. As a first step, a regional flood frequency analysis was conducted using historic streamflow data from all conducted using natoric streamiliow data from an study basins. Using a computerized technique, 10 different probability distributions were fitted to the historic set of annual peak flow observation obtained from each study basin gage. The particular probability distribution yielding the highest coefficient of correlation with the observed data was the one selected and used to construct a flood frequency diagram for each study basin. From these diagrams, floods of 2, 10, and 50 years recurrence intervals were determined. However, because long term streamflow records were not available at many stations, estimates of the higher recurrence intervals could not always be made with confidence. The second study phase con-sisted of obtaining predictions of the 2, 10, and 50 year flood peaks for each study basin using various commonly accepted methods with those of the same frequency as given by the flood-frequency diagrams. Results demonstrated that certain methods of prediction should be favored over others depending on the location within Nevada and size of the drainage are being considered.
Guidelines for use of flood peak prediction
methods in spillway design, particularly for small
earth fill dams, were subsequently developed. W75-05468

SECURITY AIR MEASURING AND DRILL WEIGHING GUIDE. Dresser Industries, Inc., Dallas, Tex. Mining Ser-

vices and Equipment Div. For primary bibliographic entry see Field 8G. W75-05515

SIMULATION OF STORM VELOCITY EF-FECTS ON FLOW FROM DISTRIBUTED CHANNEL NETWORKS,

Nebraska Univ., Lincoln. Dept. of Computer

For primary bibliographic entry see Field 2E. W75-05518

METER FOR SEWER FLOW MEASUREMENT, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 5G. W75-05522

FORM AND FLUVIAL PROCESSES IN ALLUVI-AL STREAM CHANNELS. STUDIES IN FLUVI-AL STREAM CHANNELS. 61
AL GEOMORPHOLOGY NO. 2,
I afavette, Ind. Dept. of Geosciences. For primary bibliographic entry see Field 2E. W75-05526

STUDY OF FLUID MOVEMENTS THROUGH CAUSEWAY. Geological Survey, Menlo Park, Calif. Water Resources Div. For primary bibliographic entry see Field 2F. W75-05610

ANALYSIS OF SHALLOW HARD ROCK WELL PUMPING AND RECOVERY TEST DATA, Kaunasskii Politekhnicheskii Institut (USSR). Hydraulic Div.
For primary bibliographic entry see Field 8G.
W75-05615

PRESSURE BUILDUP AND DRAWDOWN BEHAVIOR IN UNDERSATURATED RESER-VOIRS OF DISCONTINUOUS PERMEABILITY, Stanford Univ., Calif. Dept. of Petroleum En-For primary bibliographic entry see Field 4B. W75-05617

TRANSVERSE MIXING OF HEATED EF-FLUENTS IN OPEN-CHANNEL FLOW, State Univ. of Iowa, Iowa City. Dept. of Mechanics and Hydraulics. For primary bibliographic entry see Field 5B.

REVERSE FLOW ROUTING BY THE IMPLICIT METHOD,

State Univ. of Iowa, Iowa City. Dept. of Mechanics and Hydraulics. For primary bibliographic entry see Field 2E. W75-05675

DESIGN OF CULVERT FISHWAYS, Idaho Univ., Moscow. Dept. of Civil Engineering. For primary bibliographic entry see Field 8I. W75-05782

INVESTIGATIONS ON FILTER HEADLOSS, Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering. For primary bibliographic entry see Field 5D. W75-05809

MOSQUITO LAGOON BARRIER BEACH STUDY, Florida Univ., Gainesville. Coastal and Oceano-

graphic Engineering Lab. For primary bibliographic entry see Field 2L. W75-05829

8C. Hydraulic Machinery

BIOLOGICAL FILTERS, (LITERATURE

REVIEW), National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.

For primary bibliographic entry see Field 5D. W75-05537

WATER OR AIR, WHICH DO YOU PUMP, FMC Corp., Indianapolis, Ind. Pump Div.

S. Hoeppner. Water and Wastes Engineering, Vol 11, No 9, p 67-68, 70, September, 1974. 1 fig.

Descriptors: *Pumps, *Centrifugal pumps, Air, Deep wells, *Deep well pumping, Installation, Pipes, Corrosion, Design.

In an efficiently designed system, vapors of air or gas should not be allowed to enter centrifugal pumps. When air or gas get into the pump, liquids are displaced and the pump becomes air bound, wearing out rings, bearings, shafts, and even impellers from lack of lubrication. In addition, if carbon dioxide from water in deep wells is allowed to escape, these gas bubbles form a film of highly centrated carbonic acid. This acid corrodes the vital metal parts of a pump, causing severe damage. Solutions to problems of pumping and deep wells are discussed. For horizontal pumps, installation techniques are stressed. To prevent formation of air pockets on the suction side of a pump, an eccentric increaser should be used, suction piping should be laid out so that no high spots exist where air might collect, and all suction piping joints or connections should be air tight. In deep well situations, falling water must be eliminated, either by construction of wells with no well casing performations or by the installation of baffles or of a liner within the well. When gas of any type becomes entrained in well water, one special suction device may be used to separate the gas from the water. This is a normal suction pipe enclosed in a second pipe, useful when the well is of sufficient diameter. Other modifications to the pump and its impeller to prevent gas from entering the systems are described. (Prague-FIRL)

DISCHARGE DEVICE FOR A VACUUM SEWAGE SYSTEM, Aktiebolaget Cenenta, Malmo (Sweden).

Aktiebolaget Cenenta, Malmo (Sweden).

J. Andersson.

Canadian Patent 952,789. Issued August 13, 1974. Patent Office Record, Vol 102, No 33, p 30, August 1974.

Descriptors: *Patents, *Sewers, *Sewerage, Equipment, Wastes, Sewage, Water pollution sources. Identifiers: *Vacuum sewers.

A discharge device for a vacuum sewage system is described. It consists of a minimum of two sewage collection tanks, each with valve controlled inlet and outlet ducts, a vacuum source and valve controlled passages which connect each of the tanks alternatively to the vacuum source and to a source of ventilation air. The inlet duct of each tank is connected to the vacuum sewer which feeds the sewage to the discharge device. The valves controlling the inlet ducts operate so that at any time there is at least one tank receiving sewage and simultaneously connected to the vacuum source. When the tank becomes filled with sewage, it is disconnected from the sewage system and from the vacuum source and another tank is connected in its place. Removal of the sewage from the full tank is effected by connecting it to the source of ventilation air and opening the outlet duct so that sewage flows out through the outlet duct. The outlet ducts may be connected to a collecting tank under atmospheric pressure, to a sewer pit or to a conventional gravity sewer. (Orr-FIRL) W75-05553

THE DESIGN AND CONSTRUCTION OF AYCLIFFE SEWAGE WORKS EXTENSIONS, For primary bibliographic entry see Field 5D. W75-05565

FUNDAMENTAL STUDIES IN THE USE OF SONIC POWER FOR ROCK CUTTING, Ohio State Univ., Columbus. Dept. of Engineering Mechanics.

Mechanics T. Lo.

PhD Dissertation 1972. 119 p, 52 fig, 6 tab, 30 ref.

Descriptors: *Drilling equipment, *Drilling Instrumentation, Engineering, Rates of application, Equipment, Rock mechanics. Identifiers: Tool-rock impact, *Sonic drill equip-

ment. *Rock cutting equipment.

The impact of a short sonic tool on rock was analyzed and it was established that a rigid massspring model of the sonic tool is reasonable for such conditions of impact. Impact-rebound relationships and the energy loss characteristics were established for an experiment in which sonic tools were propelled into a single impact with the rock surface. A study of tool impact on the transducer has been made where tools of various geometries were used to impact directly on sonic lines. Impact and rebound velocities and the transmitted stress vere measured. Modeling of the recovery of transducer internal energy was made with knowledge of energy dissipation and the observed transducer vibration characteristics from previous works. A detailed analysis on the effects of various parameters, such as drive voltage, transducer energy storage, static force, tool-lead and tool-line parameters, has been conducted. The analyses were united in the prediction of sonic drilling rate of rocks and a numerical example is given.
(Campbell-NWWA)
W75-05621

DESIGN OF AN EXPERIMENTAL SYSTEM FOR STUDYING PHYSICAL-CHEMICAL TREATMENT OF WASTEWATER AT ELEVATED TEMPERATURES,

Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5D.

W75-05682

CONTROL APPARATUS FOR A WATER SUPPLY SYSTEM,

Weil-McLain Co., Inc., Dallas, Tex. (assignee) E. M. Deters.

U.S. Published Patent Application B 405,305, 6 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 930, No 4, p 1555, January 28, 1975.

Descriptors: *Patents, *Water supply, *Control systems, *Water delivery, Pumping, Equipment, Water distribution(Applied).

A control apparatus for a water supply system has a motor operated pump for pumping water through a delivery line to one or more valved outlets. The control apparatus includes a pressure switch responsive to the pressure in the delivery line and operable at preselected upper and lower pressure limits to respectively stop and start the pump motor and a main flow control valve which regulates flow from the pump to the delivery line and having a pressure responsive operator. Also in-cluded is a pressure regulating pilot valve respon-sive to the pressure at the outlet of the main flow control valve for controlling the pressure on the pressure responsive operator of the main flow control valve to actuate the latter and maintain the pressure in the delivery line substantially constant at a value intermediate the upper and lower pressure limits during normal flow from the delivery line. A penumatic pressure tank connects with the outlet of the main flow control valve and a bypass passes a restricted flow to the pressure tank and delivery line when the main valve is closed to build up the pressure in the tank and delivery line to the upper pressure limit at which the pressure switch stops the pump motor. (Sinha-OEIS) W75-0581

8E. Rock Mechanics and Geology

FUNDAMENTAL STUDIES IN THE USE OF SONIC POWER FOR ROCK CUTTING, Ohio State Univ., Columbus. Dept. of Engineering

Mechanics.
For primary bibliographic entry see Field 8C.
W75-05621

BEDROCK INTENSITY ATTENUATION AND SITE FACTORS FROM SAN FERNANDO EARTHQUAKE RECORDS,

California Univ., Los Angeles. Dept. of Mechanics and Structures.

K. W. Campbell, and C. M. Duke. Bulletin of the Seismological Society of America, Vol 64, No 1, (California Water Resources Center Project W-339).

Descriptors: *Attenuation, *Intensity, *Bedrock, *Earthquakes, *California, Classification, Sites, Zoning.
Identifiers: *San Fernando(Calif).

An attenuation formula was derived for the Arias instrumental intensity on bedrock based, in part on the source spectrum function obtained by Aki. The constants in the formula were calibrated for the San Fernando earthquake by using eight bedrock spectra derived from surface accelerograms. The calibrated formula was then used to compute the Arias bedrock intensities at most of the sites of the ground-level accelerographs and seismoscopes that recorded the earthquake. Maxima accelerations from accelerograms and spectral accelerations from accelerograms and spectral accelerations from accelerograms and spectral accelerations from acrelerograms and spectral accelerations from acrelerograms and spectral accelerations from acrelerograms and spectral accelerations from seismoscope records were then used to compute the Arias intensities at the surface by using an empirical relation obtained by Arias. After the instrument sites were classified into four groups, (1) crystalline rock, (2) sedimentary rock, (3) shallow alluvium, and (4) deep alluvium, surface-to-bedrock intensity ratios were correlated with these site classifications which leads to four surface attenuation curves constrained to have the

Field 8—ENGINEERING WORKS

Group 8E-Rock Mechanics and Geology

same slope. From the constant differences between these curves, it is possible to define site factors to be applied to bedrock intensity in order to estimate surface intensity for zoning purposes. Conversely, these factors can be applied to surface intensities for deriving bedrock attenuation curves for other earthquakes in which the geology of the instrument sites is only generally known. The site factors relative to unweathered, unfractured crystalline rock outcrops are 1.80 3.63, 3.74, and 5.12 for classifications 1 through 4, respectively. (Snyder-California-Davis) W75-05684

8F. Concrete

THE PARTITION OF CALCIUM AMONG CE-MENTING COMPOUNDS IN AGING HIGHWAY

Iowa State Univ., Ames. Dept. of Geology. D. E. Simon.

MSc Thesis, 1968, 82 p. 11 fig. 4 tab, 41 ref.

Descriptors: *Concrete construction, *Aggregate, *Cementing material, *Paving, Concrete testing, Road construction, Calcium compounds, Deterioration, *Aging, *Iowa.

Identifiers: Concrete deterioration. State highway system.

New approaches to sampling, analysis and preparation were devised for this study of the aging of highway concretes in Iowa. Techniques developed included a chemical partition of silica and insoluble residue, a calcium balance of the major phases present in hydrated cement and a method of recalculating the chemical data to an additive basis. The conclusions from the study are: (1) a major chemical process of aging is carbonation of the calcium-bearing phases contained in hydrated cement of concretes; (2) the primary source of CO2 is the atmosphere; (3) C3ACSH12 is the most stable phase present; (4) C6AFH12 is slowly attacked by CO2; (5) alkalis with high mobilities are concentrated at the highway surface due to the upward movement of pore water; (6) the quartz grains of the fine aggregate are being fractured and broken by carbonation of hydrated cement material at the highway surface; (7) a material balance for the calcium-bearing phases shows it is possible to establish a calcium balance for the ises in hydrated cement. This study provides a general path which chemical reactions related to aging follow to account for observed changes, as well as a chemical background for understanding the changes in concrete deterioration. (Bradbeer NWWA) W75-05611

8G. Materials

THE RISE OF POROUS PAVING.

American Society of Landscape Architects, Louisville, Ky.
For primary bibliographic entry see Field 8A. W75-05423

EXPERIMENTAL MEASUREMENTS OF PAR-TICLE MOTION IN A TURBULENT PIPE

Illinois Univ., Urbana. Dept. of Nuclear Engineer-For primary bibliographic entry see Field 8B. W75-05462

AQUIFER TESTS IN LARGE DIAMETER WELLS IN INDIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.

W75-05501

SECURITY AIR MEASURING AND DRILL WEIGHING GUIDE.

Dresser Industries, Inc., Dallas, Tex. Mining Services and Equipment Div. (1974). 11 p, 6 fig, 9 tab.

Descriptors: *Drilling equipment, *Equipment testing, Drilling, Technology, Evaluation, Instrumentation.

Identifiers: Bit design, Testing equipment, Blast hole bits, *Air measuring, *Drill weighing.

Detailed instructions on the procedure for measuring air volume in blast hole drilling with Dresser equipment and examples are provided. Charts indicating the relation between the hole size in inches and the drill steel diameter in inches, and the relation between the compressor output and the bailing velocity are provided. A table of the discharge area of jet nozzles related to the diameter, and tables indicating the pressure drop across the bit with the compressor output and the air course size for three different pin lengths are included. Eight tables give orifice meter flow rates for temperatures between 60 degrees F and 200 degrees F, pressures from 10 to 60 PSIG and orifice sizes from .75 to 2.25. Altitude correction factors, suggestions for longer bit life and procedures for the use of the Security Weight-on-Bit measuring kit and specific bit designs by Dresser are in-cluded. (Bradbeer-NWWA)

METER FOR SEWER FLOW MEASUREMENT, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 5G. W75-05522

INFILTRATION SMOKED-OUT.

Gardner Water and Sewer Dept., Ill.

J. Bexson. Water and Wastes Engineering, Vol 11, No 9, p 59-60, September, 1974.

Descriptors: *Sewers, *Pipelines, *Sewerage, Plumbing, Separated sewers, Storm drains, *Testing, *Illinois, Infiltration. Identifiers: *Smoke testing, Gardner(Ill), *Sewer

overloads. The Village of Gardner, Illinois, solved problems

of sewer overloads by smoke testing. Although the sanitary system in the town was less than 10 years old and completely separated from the storm sewers, overloads occurred even during moderately heavy rain. The overloads caused floods in many home basements, and forced bypass of any sanitary treatment. Smoke testing of the sewers was chosen because of its ability to locate problem areas in mains, laterals, and building drains. Actual testing was done by the National Power Rodding Corporation. Advance notice was given to the residents before the testing started. It was explained that smoke entering houses indicated faulty plumbing that should be corrected because sewer gas could back up the same way. The equipment for the test consisted of a portable 1500 cfm blower placed on each manhole and a plywood manhole ring lined with a 0.75 inch thick sponge rubber gasket for sealing the connection. Smoke was forced through the sewers. The smoke was a high-moisture zinc chloride which created a dense, grayish white or white mist. The smoke issued from all downspout gutters connected the sewer, from breaks, storm sewer connections and cracked house laterals. All household violators were required to attend a meeting and had the trouble explained. All but 10 households have satisfactorily repaired their violations. Repair of broken lines and illegal connections has reduced the maximum overload on the treatment plant from 1.5 mgd to 3000,000 gpd. Electricity and chlorine usage have also been reduced. (Orr-W75-05541

AUTOMATED MONITORING OF RECOVERED

WATER QUALITY,
For primary bibliographic entry see Field 5A.
W75-05545

SMOKE TESTS DETECT SOURCES OF IL-LEGAL INFLOW, Cincinnati Dept. of Sewers, Ohio.

F. S. Welker, and D. J. Miller. Public Works, Vol 105, No 9, p 90-91, September,

Descriptors: *Sewers, *Sewage, *Smoke, *Separated sewers, *Testing, Sanitary engineering, Manholes, Domestic water, Piplines, Pipes. Identifiers: *Smoke testing.

A program of smoke testing was used by the Metropolitan Sewer District of Greater Cincinnati to correct the problem of illiegal connections to its sanitary sewers. Before the tests were conducted, the sewers were visually inspected and residents were notified of the test to prevent anyone from were notified of the test to prevent anyone from becoming alarmed at seeing smoke. Fire depart-ments were also alerted. The tests were per-mormed by sealing off a manhole and pumping smoke through the area of the line being tested. Any groundsmoke observed would indicate a cracked main sewer pipe or customer service laterals, illegal downspouts, or outside drains connected to the sanitary line. Property owners were notified of any connections in violation of the rules of the Sewer Department. A four-man crew, on a typical day, was able to smoke test 1907 feet of sewer lines at a total cost of \$0.063 per foot. (Orr-FIRL) W75-05546

ANALYSIS OF SHALLOW HARD ROCK WELL PUMPING AND RECOVERY TEST DATA, Kaunasskii Politekhnicheskii Institut (USSR).

N. T. Zdankus.

Ground Water, Vol 12, No 5, p 310-317, September-October, 1974. 3 fig, 4 tab, 5 ref.

Descriptors: *Pump testing, Safe yield, Specific capacity, *Aquifer testing, Dug wells, Shallow well, *Data collection, *Well data, Bore wells, Hydrologic data, Groundwater, Flow, Equations. Identifiers: Mathematical approach.

Equations for steady, unsteady, confined and un-confined radial ground water flow to wells are combined to a single general equation whose combined to a single general equation whose validity is expanded by applying it to a shallow hard rock aquifer whose hydraulic conductivity varies with depth. The suggested method is based on the principle used by Jacob (1950) in his method. Drawdown function as a function of time is used for graphical analysis of test data. The drawdown function should be computed from the measurements in the aquifer and not in the well due to seepage face phenomena. Hydraulic conductivity is determined from dug well test data. It is a function of ground water inflow into the well discharge, which varies with the specific capacity of the well. Specific yield is assumed for the rock of the well. Specific yield is assumed for the rock type and the radius of influence is expressed as a function of time. (Bradbeer-NWWA) W75-05615

A THEORETICAL STUDY ON THE IN-TERPRETATION OF RESISTIVITY SOUNDING DATA MEASURED BY THE WENNER ELEC-TRODE SYSTEM, Missouri Univ., Rolla. Dept. of Geophysical En-

gineering. S. H. Chan.

PhD Dissertation 1969. 193 p, 69 fig, 10 tab, 24 ref.

Descriptors: *Resistivity, *Logging(Recording), Analysis, Electrical well logging, Geophysics, Borehole geophysics, Groundwater. Identifiers: *Wenner electrode system, Kernel, Associated kernel.

Education (Extramural)—Group 9A

The solution of the boundary value problem as-sociated with an n-layered earth model leads to an integral equation for the Wenner electrode system. This integral equation relates the apparent re-sistivity function to an unknown function, termed the kernel, which is dependent on the layer resistivities and thicknesses. By solving this integral equation, the kernel is not obtained directly, but a related function is, from which an explicit integral expression for the kernel can be derived. Formulas for numerical integration are developed for the calculation of both the kernel and associated kernel from apparent resistivity data. These formulas give satisfactory results. A numerical-graphical give satisfactory results. A numerical-graphical method is developed for the analysis of the kernel and the associated kernel. A further technique based on the principle of logrithmic curve matching is developed for the decomposition of the kernel alone. These methods yield reasonably accurate values for the layer resistivities and thicknesses. (Bradbeer-NWWA) W75-05618

FOULING OF HEAT EXCHANGERS FROM COOLING WATER AND PROCESS MATERI-

ALS, Dearborn Chemicals Ltd., Widnes (England). For primary bibliographic entry see Field 5B. W75-05810

8H. Rapid Excavation

NUMERICAL STUDIES OF CRATERING IN BEARPAW SHALE: TWO-DIMENSIONAL

California Univ., Livermore. Lawrence Livermore Lab.

J. B. Bryan, D. E. Burton, and M. D. Denny. Available from NTIS Springfield Va. as REPT. No. UCRL-51659. Report UCRL-51659, October 1974. 52 p, 37 fig, 3 tab, 25 ref.

Descriptors: *Nuclear explosions, *Explosives, *Excavations, *Craters, *Research and development, Channels, *Model studies, Mathematical models, Simulation, Engineering, Comparative, Benefits, Comparative productivity, Design oritoric. criteria. Identifiers: Bearpaw clay shale.

Computer calculations were performed to simulate cratering phenomena associated with subsurface detonations in Bearpaw clay shale. These calculations and a complementary field program were part of Project Diamond Ore. A cratering equivalence between nuclear and high explosives was established using the SOC and TENSOR stress-wave-progagation computer codes for dynamic modeling. Late-time ballistic and fallback modeling were utilized to define the final crater configurations. It was found necessary to run each calculation at least 20 ms to get an accurate final representation. Stemmed cratering calculations made at three burial depths (6, 12.5, and 17 m) and two source energies defined calculated nitromethane cratering curves which closely matched empirical curves. A hypothetical 20-ton nuclear source was analyzed in stemmed and unstemmed configurations. The cratering dynamics and final crater shpaes were nearly the same for the 20-ton nuclear and 10-ton nitromethane stemmed sources, the crater dimensions and volumes differing by less than plus or minus 5%. (Houser-ORNL)

8I. Fisheries Engineering

FISH PROTECTION AT INTAKE STRUCTURES AND DAMS: GUIDANCE, SCREENS AND COL-LECTION DEVICES. A SELECTED BIBLIOG-RAPHY WITH ABSTRACTS, Oak Ridge National Lab., Tenn.

Available from NTIS, Springfield, Va. as REPT. No. ORNL-EIS-74-67, ORNL-EIS-74-67, March

Descriptors: *Bibliography, *Engineering structures, *Dams, *Fish, *Damages, Ecology, Powerplants, Aquatic environment, Documentation, Abstracts, Screens, Canals, Design criteria, Locks, Pumps, Animal sounds, Light, Chemicals.

This annotated bibliography of 195 references was prepared in connection with the Environmental Impact Reports Project at Oak Ridge National Laboratory. Published and unpublished material available from libraries or government agencies was included. A complete file of all materials referenced is available in the Environmental Information System Office Resource Center files. The collection contains selected material relating to the protection of fish under adverse conditions created by man-made diversions and obstacles such as dams, canals, intake structures for power plants, and irrigation projects. It is particularly concerned with screening fish from intake struc-tures and methods for guiding fish around obstacles or out of danger zones. It covers all types of fish screens, louvers, fish pumps, fish locks, elevators, barriers, and the use of sound, light and chemicals to guide fish. Some material on the design and used of fishways and bypasses has included, but this subject is not covered in depth. The bibliography is categorized by primary and secondary subject. Author, taxonomy, keywork, and permuted title indices are included. (Houser-ORNL) W75-05372

RESPONSES OF PENAEUS JAPONICUS BATE TO FISHING NET AND ELECTRICAL STIMU-LATION FOR THE IMPROVEMENT OF FISH-

ING EFFICACY, (IN KOREAN), Pusan Fisheries Coll. (Republic of Korea). Dept. of Fisheries Technology.

K. S. Ko. Publ Mar Lab Pusan Fish Coll. 5: 1-20. Illus. 1972. Identifiers: *Electrical stimulation(Fish), *Fishing nets, Penaeus-Japonicus, *Brown shrimp, Fish

In order to improve the efficiency of the fishing gear, fundamental studies on the reaction of the oriental brown shrimp, Penaeus japonicus Bate to fishing nets in motion and their reactions to electrical stimuli were made in the field and laboratory. The reactions of P. japonicus to moving fishing nets in a seawater tank could be classified into 4 major types, i.e., jumping backward, swimming forward, sticking on the net and crawling. The herding ability of the fish net showed better efficiency when the net was towed at angles of 30, 40 and 60 degrees to the towing direction. It is desiraand ou degrees to the towing direction. It is desired ble to adjust the towing speed of the shrimp trawl net to about 0.5 m/s. It is also desirable to make a wing net of at least 4 m in width to prevent the shrimp from jumping out of the net. Most of the shrimp caught by the trammel net were within a meter from the sea bottom. The diural fishing operation of the shrimp trawl equipped with an electrical device achieved up to 89-96% of the effi-ciency of the catch in the nocturnal fishing operation. --Copyright 1974, Biological Abstracts, Inc. W75-05394

HYDROBIOLOGICAL AND ICHTHYOLOGI-CAL STUDIES ON THE COASTAL LAKES TASAUL AND GARGALIC IN VIEW OF THEIR USE FOR FISH MANAGEMENT, (IN RUMANI-AN).

E. Costea, and V. Cure.

Bul Cercet Pisc Ic, Yus So., 1971, English summary. Identifiers: Abramis-ballerus, Abramis-brama, Aristichtys-nobilis, Benthos, Bighead, Bream, Carassius-carassius, Carp, Clupeonella-cultriven-tris, Coastal lakes, Cyprinus-carpio, Esox-lucius, *Fish management, *Hydrobiological studies,

*Ichthyological studies, Lakes, Perca-fluviatilis, Perch, Pike, Plankton, Roach, Rutilus-rutilus-car-pathorossicus, Stizostedion-lucioperca, Tench, Tinca-tinca, *Romania(Tasaul-Gargalic Lakes).

Tasaul Lake (2700 ha) is a continuation of the Casimcea river (USSR) and represents the ancient minor bed of this river, which has been flooded at its mouth by the Black Sea's waters. The Gargalic Lake, 530 ha wide, is situated near Tasaul lake, in the ancient gulf of Constanta. Natural fish producthe ancient gulf of Constanta. Natural Ish productivity, estimated by quantities of the plankton and benthos, was 220 kg/ha for Tasaul Lake and 300 kg/ha for Gargalic Lake. Until management, near Tasaul, of the carp hatchery, which had to stock both lakes, the average catch in the 2 lakes was 41 kg/ha, a very low one. The fish species living in the lakes are: the carp (Cyprinus carpio L.), the roach (Butilus crutilus carrentbonesieus Vlad.) the tench (Rutilus rutilus carpathorossicus Vlad.), the tench (Tinca tinca(Linnaeus), the crucian carp (Carassi (Tinca tinca(Linnaeus), the crucian carp (Carassius (L.), Abramis ballerus (L.), the common bream (Abramis brama (L.)), and the big-head (Aristichthys nobilis (Rich.)). Predatory fishes clude: the Perch (Perca fluviatilis Linnaeus), the perch-pike (Stizostedion lucioperca (Linnaeus)) and the pike (Esox lucius (L.)); from the sea comes Clupeonella cultriventris (Nordmann). After 1964. when the lakes were stocked yearly, Tasaul Lake, when the takes were stocked yearly, I asaul Lake, with large-scale fish rearing, gave an average yield of 80 kg/ha and Gargalic, with intensive rearing, 768 kg/ha, the carp representing 71-97.8% of the catch.—Copyright 1974, Biological Abstracts, Inc. W75-05495

DESIGN OF CULVERT FISHWAYS,

Idaho Univ., Moscow. Dept. of Civil Engineering.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 \$4.25 in paper copy, \$2.25 in microfiche. Idaho Water Resources Research Institute, Moscow, May 1974. 62 p, 28 fig, 2 tab, 30 ref, append. OWRT A-027-IDA(3).

Descriptors: *Culverts, Hydraulic structures, *Orifices, *Fish ladders, Fish barriers, *Fish behavior, *Fish passage, *Fish migration, Hydrology, *Design. Identifiers: Corrugated metal pipe culverts, Box

Types of fish migration and typical fish blockage problems associated with culverts are reviewed. Swimming capability of fish as a function of specie, fish length and water temperature are discussed. The hydrologic characteristics of streams and the importance of considering the timing of fish runs and peak discharge are reviewed. A procedure for analyzing cmp and pipe arches for recommended swimming velocities is presented. Slot orifice fishways for box culverts (slot orifice placed perpendicular to the flow and skewed wing-wall slot orifice) are discussed. Design aids developed for hydraulic analysis are presented. Instream construction in or near prime fish habitat is discussed. W75-05782

THE FRESHWATER FISHES AND FISHERIES OF SOUTH FLORIDA,
Bureau of Sport Fisheries and Wildlife, Atlanta,

Ga. For primary bibliographic entry see Field 5C. W75-05802

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

TENTH ANNUAL REPORT RESOURCES RESEARCH CENTER, WATER Minn. Univ., St. Paul. Water Resources Research

Field 9-MANPOWER, GRANTS AND FACILITIES

Group 9A-Education (Extramural)

For primary bibliographic entry see Field 9D. W75-05439

UNDERSTANDING THE WATER RESOURCES RESEARCH CENTER, GRADUATE SCHOOL, UNIVERSITY OF MINNESOTA, Minnesota Univ., Minneapolis. Water Resources

Research Center. For primary bibliographic entry see Field 6E. W75-05443

AN EVALUATION OF THE RESEARCH PRO-GRAM FOR THE STATE OF WASHINGTON WATER RESEARCH CENTER.

Washington State Water Research Center, Pull-

For primary bibliographic entry see Field 6B. W75-05455

INFORMATION INFORMATION CONCERNING WATER RESOURCES RESEARCH CENTER PROJECTS,

Minnesota Univ., St. Paul. Water Resources Research Center. For primary bibliographic entry see Field 9D. W75-05467

DELAWARE WATER RESOURCES CENTER, ANNUAL REPORT/FISCAL YEAR 1974. Delaware Univ., Newark. Water Resources

For primary bibliographic entry see Field 9D. W75-05781

9D. Grants, Contracts, and **Research Act Allotments**

TENTH ANNUAL REPORT RESOURCES RESEARCH CENTER, WATER

Minn, Univ., St. Paul. Water Resources Research Center.

Available from the National Technical Inform tion Service, Springfield, Va. 22161, as PB-240 207, \$5.75 in paper copy, \$2.25 in microfiche. Bulletin 71, July 1974, 123 p. OWRT-A-999-MINN(30), 14-31-0001-4023.

Descriptors: *Research, *Water resources, *Minnesota, Education, Projects, Expenditures, Manpower, Water management, Water pollution,

Water Resources Research Act.
Identifiers: *Researchers, *Applied research,
*Basic research, Physical-biological-economic-social aspects, Faculty.

The fiscal year 1974 budget of the Minnesota Water Resources Research Center was \$441,680. The Center supported 16 research projects involving 15 faculty members. These projects involved in 15 faculty members. These projects were concerned with: monitoring the effects of stopping the flow of sewage on the productivity of Lake Minnetonka; determining whether optimum levels of investigations can be set for such groundwater reservoirs as the Twin Cities Artesian basin; developing a water resources research plan for developing a water resources research plan for Minnesota; developing indices for establishing water supply quality status and trends in Min-nesota; analyses of organic carbon as a pollution index in Minnesota; spatial variation in the percep-tion of water resources and water problems in South Central Minnesota; estimating thermal pol-lution and increased prints and hornback lately lution and increased nitrate and phosphate levels associated with alternative forest management systems in Minnesota; delineating the more immediate and crucial sets of water and related land resources planning policy alternative being con-sidered by the people of Minnesota; determining the feasibility of utilizing irrigation and ground-water recharge as means for disposal of heated water from power plants in Minnesota; the role of scientist-technician in water policy decisions at the community level; spatial and temporal variation of

precipitation in Minnesota; forecasting rainfall and snowmelt floods; determining the geochemical and biostratigraphic record of natural and pollutional eutrophication of Minnesota lakes; biomanipulation of Minnesota lakes for elimination of bluegreen algae; determining the thermal pollution and second trophic level fauna in Lake Superior; and inventorying computer programs and simulation models in water resources. About 49 students received employment throught the Center's program. During fiscal year 1974, 39 reports were generated through research projects. (Walton-Minnesota) W75-05439

UNDERSTANDING THE WATER RESOURCES UNIVERSITY OF MINNESOTA,
Minnesota Univ., Minneapolis. Water Resources

Research Center.

For primary bibliographic entry see Field 6E. W75-05443

AN EVALUATION OF THE RESEARCH PRO-GRAM FOR THE STATE OF WASHINGTON WATER RESEARCH CENTER.

Washington State Water Research Center, Pull-

For primary bibliographic entry see Field 6B. W75-05455

INFORMATION CONCERNING WATER RESOURCES RESEARCH CENTER PROJECTS.

1964-1974, Minnesota Univ., St. Paul. Water Resources Research Center. W. C. Walton.

Available from the National Technical Informa-Available Holm the National Technical Information Service, Springfield, Va 22161 as PB-240 205, \$4.75 in paper copy; \$2.25 in microfiche. Bulletin 19, April 1974, 77 p. OWRT A-999-MINN(31).

Descriptors: *Research, *Water resources, *Minnesota, *Projects, *Water Resources Institute, Education, Universities, Grants, Con-

Information concerning completed reports, projects underway, and authorized projects funded during the period 1964-74 by the Minnesota Water Resources Rearch Center through the Federal Office of Water Resources Research is summarized. Since 1964, thirty-nine projects have been completed; research results are described in 141 reports and 21 theses. W75-05467

DELAWARE WATER RESOURCES CENTER, ANNUAL REPORT/FISCAL YEAR 1974. Delaware Univ., Newark. Water Resources

Center.

Available from the National Technical Informa-Sylvandor Holman Her National Technical Information Service, Springfield, Va 22161 as PB-240 474, \$4.25 in paper copy, \$2.25 in microfiche. 1974. 62 p. OWRT A-999-DEL(6).

Descriptors: *Delaware, *Water Resources In-Descriptors: "Delaware, "Water Resources In-stitute, "Demands, Aquifers, "Energy, Land development, Microorganisms, Sewage treatment, Viruses(Indicators), Waste water treatment, Water conservation, Water pollution. Identifiers: Christina River Basin(Del), "Delaware

There is not enough readily-available water in Delaware and the Delaware Valley to meet the energy-water requirements projected for 1985. This demands increased efficiency in using water and energy, and development of untapped aquifers in the coastal area. Sewage sludge treatment and disposal are being attacked by chemical engineering and catalytic oxidation methods. LPP-1 viruses may be practical indicators of water and wastewater treatment plant efficiencies. Inorganic and organic contaminants in estuarial waters have been identified. Control of short-term BOD upsets the Delaware river is shown to be not worth the effort and expense. The Delaware Division of Environmental Control and the Delaware River Basin Commission already are using these findings. The Christian River Basin Study produced a handbook of over 50 water resources protection measures in land development. Longer-range projects include a study of the electronic properties of pure and doped water, and an investigation of oil-water mixtures as a 'curtain' for segregating waste or brackish water from an aquifer. (Varrin-Delaware) W75-05781

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition **And Processing**

WAMIS ABSTRACTS, NO. 1,

Arizona Univ., Tucson. Dept. of Watershed Management.
L. M. White, D. B. Thorud, and P. F. Ffolliott.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 291, \$5.25 in paper copy, \$2.25 in microfiche. June 1974, 111 p. OWRT A-042-ARIZ(3). 14-31-0001-

*Information Descriptors: Descriptors: "Information retrieval, Bibliographies, "Water yield improvement, "Vegetation effects, "Land management, Watershed management, Forest management, Clear-cutting, Water yield, Water sources, Arizona, Southwest U.S., Abstracts.

Identifiers: "Vegetation conversion.

Abstracts, compiled in four separate searches, show a sample of the materials retrievable through the WAMIS system, developed by the Department of Watershed Management, University of Arizona in cooperation with the Arid Lands Information System on the same campus. W75-05767

10B. Reference and Retrieval

BIBLIOGRAPHY OF PUBLISHED PAPERS OF THE ATOMIC BOMB CASUALTY COMMIS-SION

Atomic Bomb Casualty Commission, Hiroshima (Japan); and Atomic Bomb Casualty Commission, Nagasaki (Japan). For primary bibliographic entry see Field 5C. W75-05366

BIBLIOGRAPHY ON PUBLISHED PAPERS OF THE ATOMIC BOMB CASUALTY COMMIS-SION.

Atomic Bomb Casualty Commission, Hiroshima Adonte Both Casualty Commission, Filtostima (Japan); and Atomic Bobm Casualty Commission, Nagasaki (Japan).
For primary bibliographic entry see Field 5C. W75-05367

FISH PROTECTION AT INTAKE STRUCTURES AND DAMS: GUIDANCE, SCREENS AND COL-LECTION DEVICES. A SELECTED BIBLIOG-RAPHY WITH ABSTRACTS,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 81. W75-05372

MICROBIOLOGY OF WATER, (LITERATURE

REVIEW), Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab. For primary bibliographic entry see Field 5B.

THE IMPACT OF ENERGY DEVELOPMENT ON WATER RESOURCES IN ARID LANDS, LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY, Arizona Univ., Tucson. Office of Arid Lands Stu-

For primary bibliographic entry see Field 3E. W75-05471

AN ANNOTATED BIBLIOGRAPHY OF THE EF-FECTS OF LOGGING ON FISH OF THE WESTERN UNITED STATES AND CANADA, Washington Univ., Seattle. Coll. of Fisheries. For primary bibliographic entry see Field 5C. W75-05500

BIOLOGICAL FILTERS, (LITERATURE REVIEW), National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research

Lab. For primary bibliographic entry see Field 5D. W75-05537

10C. Secondary Publication **And Distribution**

DIAMOND DRILLING TERMS AND EQUIP-DIAMOND DRILLING TERMS AND EQUIP-MENT STANDARDS. Dresser Industries, Inc., Dallas, Tex. Mining Ser-vices and Equipment Div. For primary bibliographic entry see Field 8A. W75-05516

GLOSSARY, WATER AND WASTEWATER CONTROL ENGINEERING. American Society of Civil Engineers, United En-gineering Center, New York, N.Y. 1969. 387 p.

Descriptors: *Engineering, *Water quality control, *Thesauri, Documentation, Publications. Identifiers: *Glossary, *Waste water control.

This publication was a joint effort of American Society of Civil Engineers, American Water Works Association, Water Pollution Control Federation, and American Public Health Associa-Federation, and American Public Health Associa-tion. The Glossary contains terms that are regu-larly used or that have special meaning in water and wastewater engineering. As a result of this limitation, Glossary users will find it necessary on occasion to consult other source books. Other source books that may be helpful were listed. (Humphreys-ISWS) W75-05670

10F. Preparation Of Reviews

ANALYTICAL MODELING OF THERMAL DISCHARGES: A REVIEW OF THE STATE OF Vanderbilt Univ., Nashville, Tenn. For primary bibliographic entry see Field 5B. W75-05370

MICROBIOLOGY OF WATER, (LITERATURE Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab. For primary bibliographic entry see Field 5B. W75-05400

EVALUATION OF QUALITY PARAMETERS IN WATER RESOURCE PLANNING (A STATE-OF-THE-ART SURVEY OF THE ECONOMICS OF WATER QUALITY), For primary bibliographic entry see Field 5G. W75-05483

BIOLOGICAL FILTERS. (LITERATURE REVIEW), National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research For primary bibliographic entry see Field 05D. W75-05537

LITERATURE SURVEY OF INSTRUMENTAL MEASUREMENTS OF BIOCHEMICAL OXYGEN DEMAND FOR CONTROL APPLICA-TION 1960-1973, National Environmental Research Center, Cincinnati, Ohio. Methods Development and Quality As-

surance Research Lab. For primary bibliographic entry see Field 05D. W75-05753

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Contamination Limits for Real and Personal	um.	Quality of Water Resources,
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- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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WATER QUANTITY MANAGEMENT AND CONTROL

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